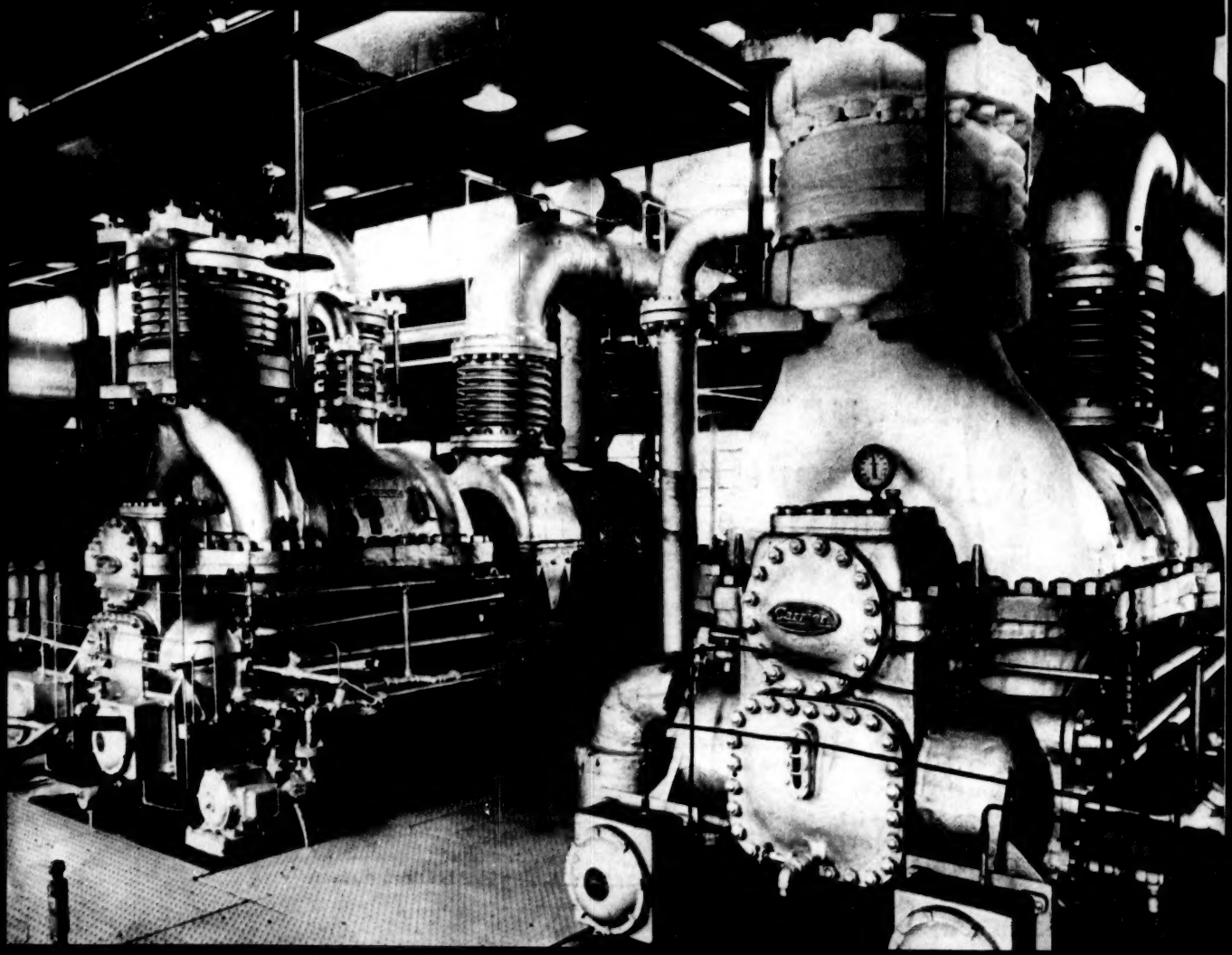
INDUSTRIAL REFRIGERATION



FLASH COOLING this boxed-in-the-field lettuce takes only 18 minutes, helps get it to market quicker, fresher. West Coast Pre-Cooling Company, Watsonville, California, operates one of the country's most modern and best equipped refrigerating plants.

How Texaco helps bring in MORE "LETTUCE" FROM LETTUCE

CLEAN, dependable compressor performance — West Coast Pre-Cooling Company assures it by lubricating these Vilter V-type ammonia compressors with *Texaco Capella Oil (Waxfree).* In fact, exclusive use of Texaco Lubricants assures top efficiency for all machinery at West Coast Pre-Cooling Company.

CRISP, garden-fresh lettuce commands top price in the market — and growers around Watsonville, California, are mighty glad to have West Coast Pre-Cooling Company's new and up-to-the-minute flash cooling plant to help them get more "lettuce" from lettuce. Frank Uvodich, West Coast's Plant Manager, explains it this way:

"Fresh lettuce, boxed in the field, is trucked directly to our plant. We flash cool it down to 33° F. in just 18 minutes. Then the refrigerator car keeps it cool and fresh — no need for extra icing of the crates. Naturally, our plant compressors must run at highest efficiency and *Texaco Capella Oil (Waxfree)* assures us the clean, dependable operation we must have."

Texaco Capella Oil (Waxfree) is the lubricant that won't precipitate wax in refrigerating systems — even down to minus 100° F. It has exceptionally low haze and floc temperatures, extra stability and resistance to oxidation. In addition, it's moisture free, won't foam and is compatible with all refrigerants.

There is a complete line of *Texaco Capella Oils (Waxfree).* A Texaco Lubrication Engineer will gladly recommend the one best suited to your operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Capella Oils (Waxfree)

FOR ALL REFRIGERATING AND AIR CONDITIONING COMPRESSORS

TUNE IN . . . TEXACO STAR THEATER starring JIMMY DURANTE on television . . . Saturday nights, NBC.

VESTIBULE TYPE TRACK DOOR

YEARS OF SATISFACTION

"Butcher Boy"

Quality Since 1885

WHY "BUTCHER BOY" DOORS ARE THE FINEST REFRIGERATOR DOORS BUILT!

These Exclusive Features Furnished At No Extra Cost

DOOR STRUCTURE

HARDWARE

APPEARANCE

When a Man Thinks Twice ...He Makes Comparisons

BUTCHER BOY REFRIGERATOR DOOR CO. HARVARD, ILLINOIS

STAND-OUT

New Frozen Food Container

MID-AUGUST brought the first sea-going test of Alcoa's new insulated aluminum container for frozen foods — a method which requires no transportation refrigeration equipment. Considered revolutionary in long distance transportation of frozen perishables, the practical experiment consisted of three tons of consumer commodity "super-chilled" to minus 150 F by liquid nitrogen, consigned to a Venezuelan supermarket in Guanta from Libby, McNeill, Libby, Chicago.

Tjae Reinier, engineer, Union Stockyards Research Div., shows W. C. Mitchell, vice-president of Libby, McNeill & Libby, fruit and vegetable packers, a thermo-couple indicating that temperature inside container is about 300 degrees below zero, as frozen food is packed for shipment to Venezuela. By a revolutionary new liquid nitrogen process the food is frozen for shipment at 150 degrees below zero and requires no refrigeration enroute. Tests have shown that food taken from the insulated container after 41 days was still frozen to zero.

The container, supplied by Aluminum Company of America, requires no refrigeration equipment whatsoever, yet will keep its load of frozen foods below 0 F until delivered to the customer in Guanta. The "super-chill" method of shipping frozen food is expected to be less expensive than any current system and is definitely more efficient, according to project participants.

The insulated aluminum container was loaded and super-chilled at Continental Freezers of Illinois, Inc., Chicago, then sealed and shipped via National Carloading to New York, where it was placed on the deck of the Grace Line ship, The Santa Monica. The test shipment is a joint project of the Grace Lines, Libby, McNeill & Libby and Aluminum Company of America.

(Continued on page 61)

Industrial Refrigeration

formerly **ICE AND REFRIGERATION**
Now in its 64th Year of Publication
J. F. NICKERSON, FOUNDER

Vol. 129 **September, 1955** **Number 3**

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The Cover:

Two NH_3 centrifugal compressing units installed at a hydrocarbon chemical plant. More and more of these units for direct compression of ammonia are being installed. Their advantages are lower initial first cost per ton or per hp, minimum floor space requirements per same units of compression, and vibrationless characteristic allows installation at any level. Present minimum tonnage limits is at 700 for direct compression and 300-400 for booster service. See page 13 for article on the centrifugal compression of ammonia.

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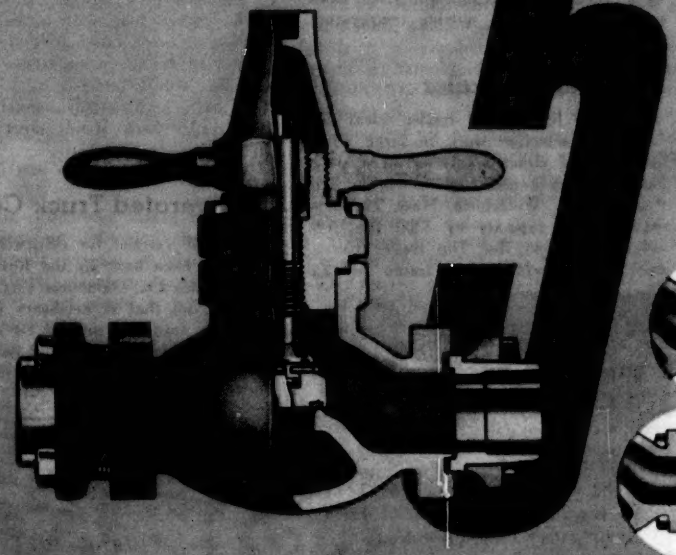
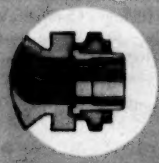
FIVE TYPES OF C[illegible]CTIONS IN HENRY

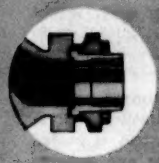
SEMI-STEEL WING CAP [illegible]VES



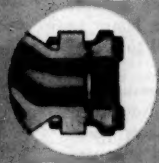
F.P.T. In Valve Body ½" thru 2½"



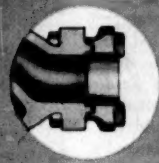
O.D. Solder Brass Adapter and Steel Flange 1⅜" thru 5⅛"



Steel Butt Weld Adapter and Steel Flange 1¼" thru 8"



One Piece F.P.T. Flange 1¼" thru 6"



One Piece Slip-on Weld Flange 1¼" thru 6"

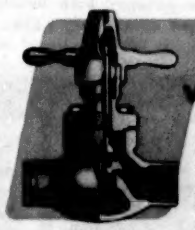
MAKE INSTALLATION EASY

Specify Henry Wing Cap Valves with their wide choice of end connections and your installation costs will always be low.

For example, steel pipe can be screwed directly into the valve body on sizes thru 2½", or it can be screwed into one piece F.P.T. flanges on sizes 1¼" thru 6". It can also be butt welded to separate steel adapters with companion flanges or used with one piece slip-on weld flanges in the same larger size range. If copper pipe is used, separate brass O.D. solder adapters with companion flanges permit soldering or brazing.

BRONZE BODY VALVES all have O.D. solder connections.

Henry offers you other features as well: Full capacity and unrestricted flow—patented self-aligning stem disc that will not rotate—resilient packing—back-seating design which permits repacking under pressure— a gasketed wing cap with socket which, when inverted, can be used to operate valve.



BRONZE ALLOY WING CAP VALVES

Made of bronze alloy to meet government specifications. Compact design —relatively light weight. Bolted bonnet construction and heavy wall bodies for maximum strength and safety. O.D. solder connections machined in valve body. Size range: ⅞" thru 4⅛" globe type; ⅞" thru 3⅛" angle type.

Your favorite wholesaler has a complete line of Henry Wing Cap Valves or can get them for you.

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Valves, Driers, Strainers, Control Devices and Accessories for Refrigeration, Air Conditioning and Industrial Applications.

What's New

MACHINERY
APPLIANCES • PROCESSES

Valve Lubricant Tested At Sub-Zero Temperatures

A SPECIAL sub-zero "torture chamber" to duplicate field conditions was used at Rockwell Manufacturing Company's Meter and Valve Testing Station to test a newly developed valve lubricant for hydrocarbon gas lines operating at temperatures ranging from minus 50 to 120 F.

Tests were performed in a walk-in freezer, composed of two rooms, a test room and an antechamber. Before entering the test room, engineers became acclimated to low temperatures in the refrigerated antechamber to prevent possible harm from a sudden and drastic temperature change. The entire system is cooled by a three-stage compressor and exhaust system which takes about five hours to reduce the temperature from 70 to minus 50 F.

The experimental lubricant formula was tested in a 24-inch Rockwell-Nordstrom valve. A standard type valve stem packing was used and the compound gear was greased with a special low temperature gear grease. The valve was mounted in the deep freeze chamber on a fabricated steel framework for stability. Line fluid used was nitrogen, supplied from a manifold hooked up so that the gas could be directed into the valve from either flanged end. A regulator was provided to permit close pressure control.

Results of the test program indicated the new lubricant formulation gave a leak-tight seal at temperatures ranging from minus 50 to plus 70 F, at 50 psi and 800 psi line pressure, both balanced and unbalanced on either flange. Even at minus 50 F the operating torque was not excessive. Substitution of a specially prepared low temperature packing for conventional packing materially reduced the torque, as much as one-third at minus 50 F.

While the test was underway, the valve was readily re-lubricated at minus 50 F by a Rockwell hand gun which had been brought in from an outside temperature of 70 F.

Lightweight Trailer

A NEW lightweight trailer ideal for order selection work in large warehouses, used either singly or in a train has been announced by Lewis-Shepard Products Inc., Watertown, Mass. The new truck has a capacity of 2300 lbs., yet weighs only 245 lbs. The trailer has a one-piece all-welded steel frame with a 1⅛ inch tongue and grooved hardwood deck. The steel bound deck has rounded corners with no sharp edges to damage loads or injure operators.

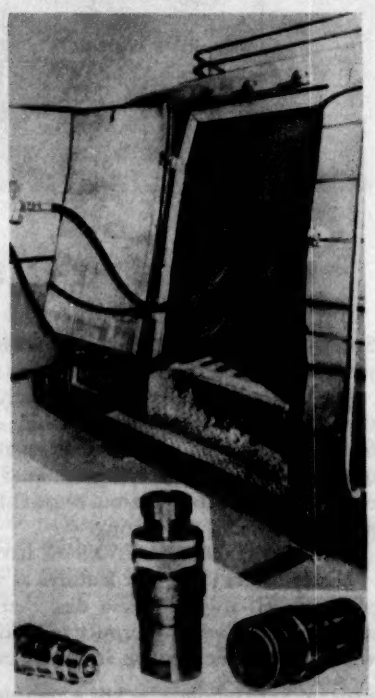
New Lightweight Trailer Announced by Lewis-Shepard

Both the 10 inch diameter main wheels and the 8 inch diameter swivel casters are Celoron, a floor protecting plastic, which also offers an easy rolling, quiet operation. Plate-type casters operate on two rows of ball bearings running in hardened raceways to provide longer caster life and easier swiveling. All wheels have roller bearings with grease retaining washers; main wheels have removable axles within tubular housings.

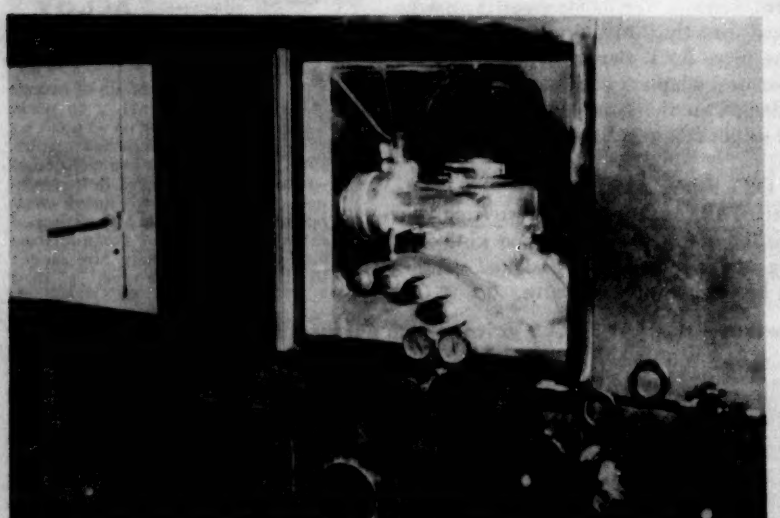
Standard deck size is 36 inches wide x 54 inches long with a height of 14 inches, although other sizes are available. End rack is 42 inches above deck and contains a bill holder with a blackboard face and a push bar for manual operation. The trailer hook stands erect when not in use.

Refrigerated Truck Coupler

A NEW coupler for refrigerated trucks has been built by the Rex Engineering & Sales Co., Oklahoma City, Okla. To connect, all that is necessary is to push the plug into the socket. To disconnect, the sleeve on the socket is pulled back. A check valve in the end of Coupler automatically shuts off instantly. The design is a patented, simple, rugged Coupler consisting of a specially constructed plug and socket which form a self-sealing locking mechanism. Check valve seal action makes Coupler leak proof. It has an extra high flow capacity. Full swivel action eliminates torsional hose strain. Working capacity 5,000 p.s.i.



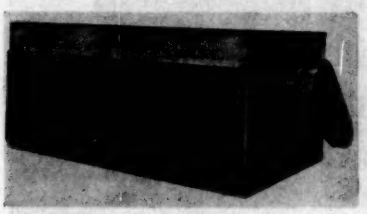
New Coupler for refrigerated trucks with connections



This sub-zero "torture chamber" which duplicates field conditions used at Rockwell Manufacturing Company's test station to test a newly developed valve lubricant for hydrocarbon gas lines.

Defrost Product Coolers

A SERIES of glycol defrost product coolers for low temperature refrigeration applications has been introduced by Bush Manufacturing Company, West Hartford, Conn. The new units, available in floor-mounted or ceiling-hung models, feature Inner-Fin coil construction. This patented design feature, exclusive with Bush, permits units to defrost from the inside.



The Glycol defrost product cooler

Inner-Fin coil design makes possible an entirely separate defrosting circuit. This defrost circuit consists of glycol pump, cast aluminum glycol heater, timer and magnetic contractor and is furnished as an assembled kit.

Company officials point out that complete containment of glycol eliminates dilution of defrosting medium, abolishes need for replenishing or distilling, and reduces danger of defrost failures from freeze-up.

Mobile Ice Service Unit

A NEW "Mobile Ice Service Unit", which utilizes York-Flak Ice Automatic Ice Maker and a Gennett Ice Cart, has been announced by York Corporation, York, Pa., and Gennett & Sons, Inc., Richmond, Ind.

The Model DER-2B York-Flak Ice Automatic Ice Maker rests on a specially designed stand with an opening underneath for the Gennett ice cart. The cart is placed in position and the machine is turned on. When the cart is full, the automatic thermostat control stops the ice making operation. The machine is then turned off and the cart withdrawn. A new one is placed in position and the ice maker is started up again.

Suited to hospitals, hotels, and supermarkets, the mobile ice service unit prevents wasted time and motion by providing ice near the point of use. The small, compact York ice maker can be located strategically at various floors or sections and the Gennett carts used to carry the ice the short, additional distance.

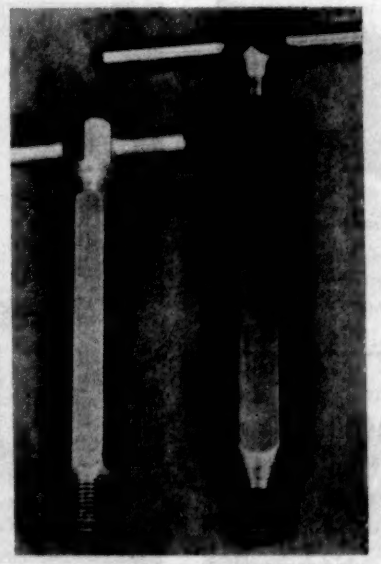
It is a completely self-contained unit with a hermetically sealed refrigeration circuit. The unit can produce up to 300 pounds of ice a day, but is designed for economical use in establishments requiring as little as 200 pounds a day. Light weight and compact design make the DER-2B particularly suitable for multiple installations.

Gennett Ice Carts are available in four sizes of 50, 75, 150, and 250 lb. capacity. Constructed of stainless steel, inside and out, with three inches of insulation, they may be used as service cabinets or ice storage bins.

The Mobile Ice Service Unit

Extension Lubricator

AN Extension lubricator for injecting lubricant as packing in pump shaft stuffing boxes is being offered by Rockwell Manufacturing Company's Meter and Valve Division. Previously made up for individual customers at their request, the lubricator is now available as a stock item to meet the heavy demand from pump makers and users. Available in brass or cadmium-plated steel, the new accessory comes in two over-all lengths — 6-3/8 in. and 8-7/16 N.P.T. thread connector. The longer model with larger lubricant barrel is available with either 1/4 in-18 or 3/8 in-18 N.P.T. thread connector.



Extension lubricator by Rockwell manufacturing company

Diffusion Type Drip Pan

IN REMODELING walk-in coolers by removing baffles and old solid-type drip pans and placing the coils to form a single bank which is placed in front of the cooler door, coupled with a diffusion type drip pan, has resulted in increased compressor efficiency, lower defrosting cycle and the maintenance of better sanitary conditions in the cooler, according to Ivar Skipple, Skipple Service, 1902 W. North Ave., Chicago 22.

Diffusion Type Drip Pan

The single bank coil installation coupled with the distribution of air made possible by the diffusion design drip pan manufactured by Skipple Service is preferable to convection distribution of air, particularly for meat refrigeration, states the manufacturer.

The diffusion type of drip pan construction provides better directional air flow. The pan is constructed of prime galvanized sheets with insulated moisture collectors and large sized waste outlets allowing for wash downs and sanitary maintenance. Of sturdy construction, they may be used with ammonia or brine coils. Supplied in any width and length by coupling together with a solder yolk.

New Respirator Offers "All-Vision" Facepiece

A NEW Chemical Cartridge Respirator with an "All-Vision" facepiece is described in a bulletin recently published by Mine Safety Appliances Company of Pittsburgh, Pa. Offering new safety with comfort and convenience, the MSA "All-Vision" Chemical Cartridge Respirator was designed to allow better vision and more freedom of movement while giving complete protection to men working in areas contaminated by light concentrations of organic vapors, acid gases, ammonia, dusts, mists, fumes, and smokes. It is said to be ideal for use in atmospheres which would ordinarily be uncomfortable or would have a toxic effect after a long or repeated exposure.

The new respirator has a gas-mask-like facepiece to which a rubber boot has been fabricated. The boot holds two chemical cartridges in series, an inner cartridge, available in two fills, and an outer cartridge, available in three. The inner cartridge may be obtained either for protection against organic vapors and acid gases, or ammonia. The outer cartridge may be had with either of these fills, or, in addition, a fill known as the Type H Ultra Filter Cartridge which offers protection against dust, fumes, mist, and smoke. Inner and outer cartridges can be used in any combination to meet specific needs.

HOWE AMMONIA COMPRESSORS
feature full internal
force-feed lubrication
to every bearing.

"Old in years Young in Ideas"

HOWE

OFFERS MORE PRODUCTS OF
MODERN DESIGN FOR
LOWER COSTS

Refrigeration specialists of 43 years, in complete systems or any of its component parts, Howe engineers can supply you with correct equipment to provide exact humidity and temperature control for any given product or service.

RAPID FREEZE
UNIT COOLER

SHELL & TUBE
CONDENSER

SINCE 1912, manufacturers of ammonia compressors, condensers, coolers, fin coils, locker freezing units, air conditioning (cooling) equipment. Immediate delivery!

HOWE ICE MACHINE CO.

Distributors in Principal Cities • Cable Address: HIMCO, Chicago

2829 Montrose Ave. • Chicago 12, Illinois

Distributors: Several Exclusive territories still available.
Your inquiry invited.

Ice-Handling Truck for Railroad use

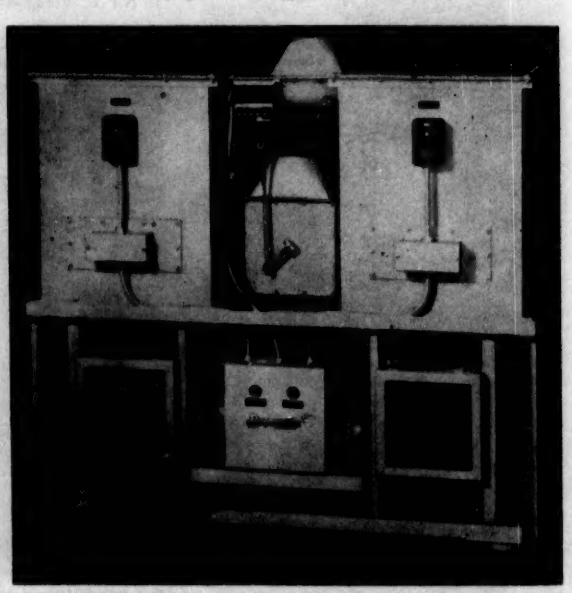
AN ELECTRIC-driven industrial truck that speeds icing of transient railroad passenger cars has been built by Automatic Transportation Company, Chicago, Ill. The unit, which can also fill other assignments in coach yards and icing stations, is equipped with special icing grates and a drip pan. Its platform measures 66 inches long by 38 inches wide.

Electric Drive Industrial Truck with capacity of 4,000 pounds

In operation, the truck can lift 4,000 pounds of ice 150 inches for unloading through the tops of cars. Lowered height of the platform is 16¼ inches. The ice-handler has dual controls for operating the lift from either end of the platform, so that the operator can ride the lift up to unload ice into the cars.

Dehumidifier Features Thermostatic Control

DEVELOPMENT of a new adsorption type, heavy duty dehumidifier suitable for use in factories, warehouses, storage vaults and other large areas where controlled humidity is desired was recently announced by the Dryomatic Corporation of Alexandria, Virginia. Suggested applications for the new Dryomatic T-150 are in candy plants, refrigerated warehouses, dairies, fur



New Dehumidifier With Thermostatic Control

and garment storage, electronic instrument areas, chemical laboratories, seed storage, and for rapid drying of plaster in the building industry. The machine may also be used with air cooling equipment for low temperature, low humidity installations.

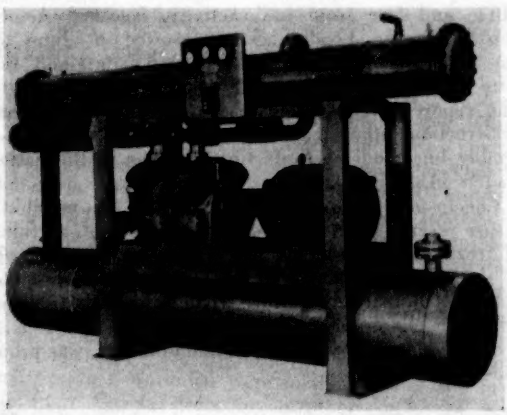
The Dryomatic T-150 is an automatically regulated dual-tower unit, using silica gel as the drying agent. It is designed to maintain humidities as low as 10 percent in areas up to 60,000 cubic feet over a wide range of temperatures. The machine has a dry air output of 150 cubic feet per minute and is capable of removing four to five lbs. of water per hour. The regeneration of the silica gel is accomplished automatically by electric heating elements.

The machine features a newly designed motor-operated four-way valve which alternately directs the air from one silica gel tower to the other. As one tower is regenerated the other continues to dehumidify, thus providing constant flow of dry air. A further novel feature is the use of thermostats for control of the regeneration cycle, thus making the machine self-adjusting to atmospheric conditions.

The unit requires only standard electrical outlets and a minimum of duct work. It is compact and can be mounted on casters for easy relocation. Built-in or remote humidistat control can be provided for completely automatic on-off operation. It measures 51x28x44 inches, weighs approximately 400 lbs, and is finished in light gray enamel.

Packaged Water Cooling Machines

A COMPLETE line of "packaged" water cooling machines designed for air conditioning and process refrigeration installations ranging in size from 5 to 125 horsepower is announced by Carrier Corporation. Models are available from 25 to 75 horsepower for handling the varied applications for chilled water under 100 tons capacity. Particularly suitable for installations where space is critical, they will pass through the average-size doorway.



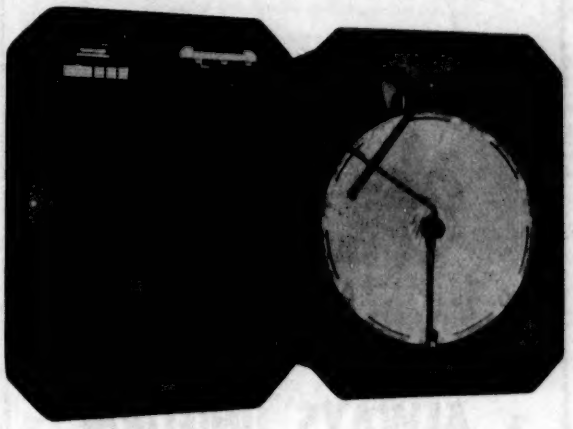
Carrier 75 hp unit "packaged" refrigerating machine

All components of the refrigerating system — compressor, condenser, and cooler — come as a single unit, piped, filled with oil and a holding charge of refrigerant. Mounted in a rugged frame of structural steel, the units can be easily installed. After placing the equipment in position a few water and electrical connections complete the installation.

Built for heavy duty operation, the compressors are available with automatic capacity control which "unloads" cylinders for matching the compressor operation to cooling requirements.

Minimum space occupancy has been accomplished in the smaller models by assembling the compressor, cooler and condenser in a vertical plane — one component above the other. Larger capacity units resemble the side type of assembly peculiar to centrifugal machines. Small water chillers from 5 to 20 horsepower come equipped with Carrier's time-proven hermetic compressors which are entirely enclosed, and have no shaft seal. These units are completely charged with refrigerant.

Taylor Truck Thermometer
PROTECTS YOU
against spoilage claims!



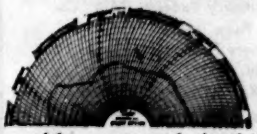
Gives you a minute-by-minute record of temperature

The Taylor Refrigerated Truck Recording Thermometer is a safety device specially designed for carriers of perishable foods. It gives you a complete record of the temperature maintained while produce is in transit and protects the carrier against unjust claims of spoilage due to other causes.

Can be mounted inside or outside truck

Neoprene door gaskets make the case dust and moisture proof. A built-in cylinder type lock which prevents tampering with the instrument is available at small extra cost.

Gives you clear, permanent chart records



Unaffected by vibration. The Taylor Truck Thermometer gives you positive proof of adequate refrigeration . . . plus a valuable means of checking on your equipment and operating efficiency. Write for Descriptive Bulletin 98208. Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Taylor Instruments
MEAN ACCURACY FIRST

✓ ALWAYS UNIFORM
✓ ALWAYS DRY
✓ GUARANTEED 99.99% AMMONIA

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Colorado—Denver—The Chemical Sales Co.
Illinois—Chicago—The Creamery Package Mfg. Co.
Indiana—Indianapolis—Wm. Lynn Chemical Co., Inc.
Iowa—Sioux City—Kennedy & Parsons Co.
Waterloo—The Creamery Package Mfg. Co.
Kansas—Wichita—Barada & Page, Inc.
Kentucky—Louisville—Merchants Chemical Co., Inc.
Louisiana—New Orleans—Barada & Page, Inc.
New Orleans—Whitman-Holloway-Oliver
Michigan—Detroit—Davis Supply Co. of Detroit, Inc.
Flint—Davis Supply Co.
Minnesota—Minneapolis—The Creamery Package Mfg. Co.
Missouri—Kansas City—Barada & Page, Inc.
Kansas City—The Creamery Package Mfg. Co.
St. Louis—Barada & Page, Inc.
Nebraska—Omaha—Kennedy & Parsons Co.
Ohio—Cincinnati—John H. Schafer, Inc.
Oklahoma—Oklahoma City—Barada & Page, Inc.
Tulsa—Barada & Page, Inc.
Tennessee—Nashville—John Bouchard & Sons Co.
Texas—Austin—R. M. Hughes & Co.
Corpus Christi—Barada & Page, Inc.
Dallas—Barada & Page, Inc.
El Paso—H. J. Baron Co.
Houston—Barada & Page, Inc.
Odessa—Barada & Page, Inc.
San Antonio—R. M. Hughes & Co.
Utah—Salt Lake City—Louis A. Roser Co.
Wisconsin—Milwaukee—Reichel-Korfmann Co.

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PRESS BRIEFS

Mechanical Refrigerator Cars In Operation

TO FIND out something about the outlook for the supply of mechanical refrigerator cars, major refrigerator car lines and those railroads which operate their own refrigerator cars, were queried. Replies to date give the following information.

Fruit Growers Express Company is now operating 597 mechanically equipped refrigerator cars and has 413 more on order which are scheduled for completion early next year. FGE President, J. C. Rill, says, " . . . we plan to add as many more in the future as the trade will use."

In addition to the 50 mechanical refrigerator cars they are now operating, Merchants Dispatch Transportation Corp. and Northern Refrigerator Line, Inc., report they have 100 more such cars on order.

Union Refrigerator Transit Co. reports it is currently operating three mechanically equipped cars with 25 more on order. "It is entirely probable we will have to consider building additional equipment within a reasonable time," says URT President, C. L. Phillipp. — NARW Quick Sheet.

Atomic Blasts Fail To Harm Frozen Food

GOVERNMENT experiments (Operation Cue) at Yucca Flats, Nevada, in May indicated that frozen foods stored in freezers during the blast were still edible and free from radio-activity. National Association of Frozen Food Packers reported in June that the foods were still below zero F, maintained their taste quality and nutritional value to a high degree. The report did not indicate the nature of the freezer construction, other than indicate it was a standard assembly line model manufactured by one of the nation's leaders in that field.

Conclusions drawn, were that it will be possible to assure every American homemaker of the usefulness of frozen foods from her freezer in the event of what is sincerely hoped will never happen—atomic attack. NAFFP's Research Director, H. P. Schmitt, was project officer in charge of the frozen food program. Dr. K. G. Dykstra, Manager of Birds Eye Laboratories, was project consultant.

Rubel Sues City Products

A $1,500,000 suit has been instituted in Federal Court in Newark, N. J., against the City Products Corp., with offices at 1 Exchange Pl., Jersey City, and its subsidiaries. The suit was brought by Charles Handler, Newark lawyer, for the Rubel Corp. of New York, which is engaged in the ice business in New Jersey and New York. Rubel has ice manufacturing plants in Newark, Jersey City and Union City.

The suit alleges the City Products and its subsidiaries have illegally lowered their ice prices below manufacturing costs to put Rubel out of business. Also, it is alleged, that City Products and its wholly owned subsidiary, Seaboard Terminal & Refrigerating Co. of New Jersey, gave secret cash rebates in violation of the law and are subject to triple damages and liable to criminal prosecution.

Service Order Conserves Refrigerator Cars

DECLARING that there is a critical shortage of box and refrigerator cars, the Interstate Commerce Commission has issued Car Service Order 905, effective July 25. The order affects refrigerator cars at ports and limits to seven days the free time they can be held for unloading at the point of transfer from car to ship. Storage time when a car is held short of such transfer point is included in the seven days. Saturdays, Sundays, and holidays are excluded in computing free time which is computed from the first 7:00 a.m. "after notice of arrival or constructive placement is sent or given to the party entitled to receive same until final release of the car, less time required to move a constructively placed car from hold point of unloading. The order expires at midnight, December 31, 1955. — NARW Quick Sheet.

May Air-Condition New York Subway Cars

NEW YORK CITY's sweltering subway riders, long packed in like sardines, may always be packed in like sardines, but cooled. Chairman Charles L. Patterson of the city's transit authority ordered a study of the possibility of air conditioning the subway's 7,000 cars, says a news report. If air conditioning ever were approved, the city's transit system would become the first air conditioned subway in America. Authority General Manager Sidney H. Bingham was directed to arrange for a test air conditioning in one subway car before September 1.

Workman Loses Foot in Ice Crusher

A 22-YEAR old dock worker at a Denver ice plant lost his right foot and a part of his leg when a motor driven spiked ice crusher caught his pants leg and dragged him into the machine. The victim, Ted Garcia, was pinned in the crusher 30 minutes while firemen and company employees worked frantically to free him. Garcia remained conscious throughout the ordeal although his foot was torn off just above the ankle and his whole right leg from the knee down was shredded by four-inch spikes on the machine drum.

A company welder, John Fox, was able to cut away a steel guard on the machine with a cutting torch when the other workmen were unable to tear the machine apart. Garcia, according to other employees, was working on the spiked crushing machine and apparently attempted to force a block of ice into the equipment with his foot. His pants were caught by the four-inch crusher spikes and he was pulled into the crusher.

Arm Injured in Ice Crusher

PROMPT action by fellow workers saved an employee of the Utah Ice & Storage Co., Salt Lake City from the loss of an arm mangled in an ice crushing machine. When the arm of Louis H. Parker, 57, was caught in the machine, workers promptly cut off the power and applied a tourniquet awaiting a police ambulance. Ambulance crewmen said the bones of the arm were crushed both above and below the elbow. At St. Marks Hospital his condition was reported as fair and it was expected that his arm could be saved unless complications developed.

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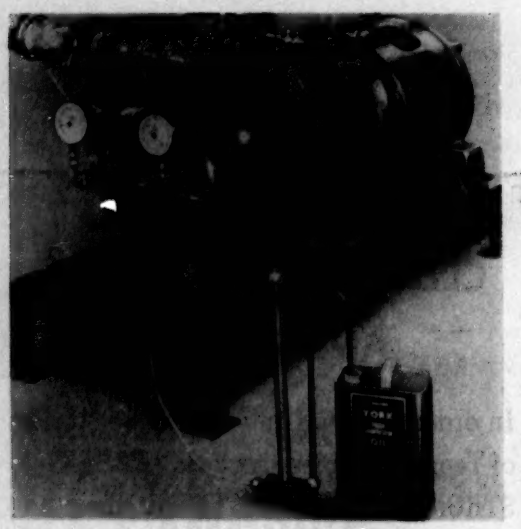
New Compressor Oil Charger

A NEW, improved pump for charging oil by hand into "Freon" or Ammonia compressors without pumping a vacuum on the crankcase is now being offered by York Corporation. The York "Super" Oil-Charging Pump eliminates difficulties often encountered by operators not familiar with the regulation of compressor valves. It prevents admission into the crankcase of air which eventually enters the condenser and builds up excessive condensing pressures, with resulting less efficient operation.



York pump for charging oil into compressor

Moderately priced, this new oil-charging pump possesses the following features: (1) Increased pump capacity and improved valve design; (2) Used with either one-gallon or five-gallon cans, it gets all the oil; (3) Suction tube furnished with the pump extends nearly to bottom of can—air cannot enter system while tube is immersed; (4) T-handle grip, extra length, and sturdy construction make for easy operation; (5) Wearing parts are easily replaceable, pump is easily dismantled for cleaning; (6) Threaded outlet—protected by a cap when not in use—fits standard ¾-inch charging connection; (7) compact — fits ordinary tool box.

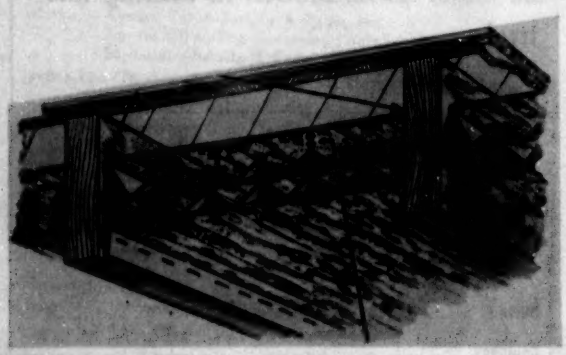
Improved Thermal Insulation

IMPROVED thermal insulation of increased insulating efficiency has been announced by Infra Insulation, Inc., makers of multiple aluminum foil reflective insulations. The new insulation is called Infra type 6PS. It is recommended for use in ceilings, roof spaces, and crawl spaces for cold storage and air conditioned structures.

In addition to three aluminum sheets and two accordion fibers which reach from joist to joist, the top inner space has been substantially increased to a full inch clearance above the peaks of its accordion fiber pleats. According to Infra, this further reduces heat flow by convection and conduction. The top sheet of aluminum is separated 1¾ inches from the center aluminum sheet, on which rests an acordion fiber ¾ inch deep. There is an additional sheet of aluminum 1¼ inches below.

The final result is a three-inch extra deep, multiple-layered aluminum, fiber and air space insulation that reaches new heights in effectiveness against heat flow by conduction, convection and radiation. Type 6PS is made for 16 and 24 inch centers, compactly packaged in small cartons containing 250 sq. ft. of insulation weighing 34 lbs.

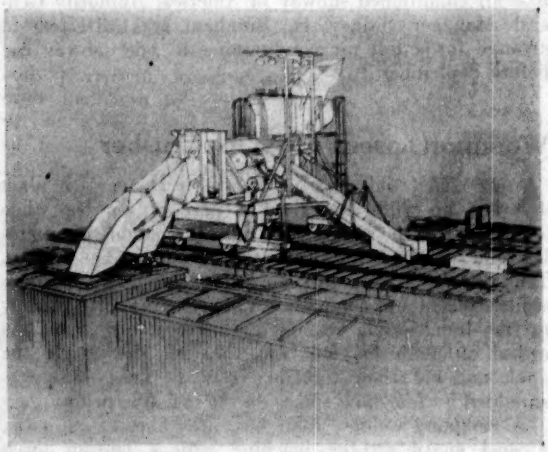
The value of reflective air spaces as thermal insulation is discussed by L. W. Schad of Westinghouse in an interesting booklet entitled "Insulating Effect of Successive Air Spaces Bounded by Bright Metallic Surfaces". A copy may be obtained by writing to Infra Insulation, Inc., 525 Broadway, New York 12, N.Y. or in care of this publication.



Improved Infra Insulation type 6PS, for ceilings, roof spaces, crawl spaces, cold storage and air conditioned structures. Note full one-inch air space above accordion peaks.

New Dock-Type Car Icer Announced By Link-Belt

AN entirely new dock-type car icer, designed for fast icing of railroad refrigerator cars, has been added to Link-Belt Company's line of icing equipment. Known as "Model 55," the new machine for high-speed bunker icing is completely automatic, and one man can operate it.



The new Model 55 dock-type car icer made by Link-belt Company

Many advantages it is claimed, can be realized by mechanizing railroad icing docks with this icer. Train delays are reduced to a minimum, for on-time arrival of perishable produce. Loss through ice shrinkage is reduced. Efficiency is increased and operating costs are lowered. It can deliver three sizes of ice — chunk, coarse or crushed. It receives 300- or 400-lb. cakes of ice "on the flat" from a dock conveyor, crushes the cakes and delivers the ice in the desired size to car bunkers, all automatically. It processes up to 40 cakes of ice per minute and can ice each car in a matter of seconds.

The machine is track mounted, self-propelled and can be easily adapted to existing railway docks. It consists of a pick-up conveyor, a crusher unit, a reversible cross conveyor and two pivoted discharge chutes, which deliver to the bunkers. One man controls all operations of the machine from an elevated platform which provides complete visibility grouped together in the control station for ease of operation. This model is available in two designs, the single-end and double-end types. The double-end type has two pick-up conveyors and two crushers.

In the Spotlight

AMMONIA Centrifugal compressors have been a long time coming into their own, but applications in the last few years have definitely proven their advantages over reciprocating types. First cost, installation economies, space saving, minimum maintenance headaches, and favorable heat balance (where located in steam plants), attract the large tonnage operator. Construction details of a typical unit is given in the article starting on page 13, briefly describing applications in chemical, meat packing, and brewing industries.

THE ASSISTANCE of refrigeration is an essential to the delivery of fishery products to the consumer in a desirable state of freshness. This means that it must be used in all stages including catching, processing, packaging, freezing, storage, transportation, distribution and delivery. The reasons for this meticulous care are told in the article starting on page 18.

NEW COLD STORAGE Construction was high-lighted when the new concern of Southern Michigan Cold Storage Company commenced operations with an $800,000 first section at Benton Harbor, Mich. The new plant will be further increased with an addition for early 1956 occupancy. For description and pictures, see article on page 20.

DRY WALL Insulation construction for refrigerated rooms figured prominently in the new food processing plant of Consolidated Foods Corporation, River Grove, Ill. Principles of this method of construction and other details are included in the article on page 26.

THE LADIES attending the annual NAPRE Convention will, as usual, be provided with an "education and entertainment" program specially planned for them. For details see article which starts on page 36.

PRACTICAL refrigeration engineers are given a few do's and don'ts concerning selection installation and operation of cooling towers and evaporative condensers, starting on page 27. A paper given before Michigan Chapter No. 1, is revised to make available many practical pointers on this topic. Three tower-condenser selection problems are worked out as examples of how an engineer may use the manufacturers' literature in helping select the proper water-saving unit.

AS FALL Approaches, with its chillier weather, refrigeration men's thoughts turn from summer air conditioning problems to those of heating. Two articles deal with Heat Pump applications in Indianapolis and Chicago. On page 39 Fred C. Barton reports on performance and some design features of a multistory office building, using well water as a heat source. Ion Caloger, at Chicago used an earth heat source for a single-story suburban type office building application, which he describes on page 40.

A NEW MECHANICAL Refrigerator car has been designed and built by the Electro-Motive Division of General Motors, utilizing cold wall refrigeration with air ducts around the all-steel all-welded cold wall lining of the car. For description and picture, see page 24.

PRACTICAL Refrigeration and It's Insurance Service, on page 42, by C. D. Drane, sums up engineering and safety services provided free-of-charge to clients by the Nation's Underwriters. Highlights of the article are a number of case histories, where cause of machinery or product damage, resulting in substantial claims, started with an apparently insignificant derangement.

HOW TO BUY Insurance for the ice and cold storage industries, published in the February INDUSTRIAL REFRIGERATION continues to draw comments, mostly favorable, from readers. The latest of these are combined in one article, on the whole very commendatory, but with suggestions of other angles that might have been covered. See article on page 46.

FOR THE Preservation of vital company records and other valuable papers in case of an atomic attack, a number of storage places are available for use by the public. One of these is the Iron Mountain Atomic Storage Vault near Hudson, N. Y. This plant is described in the article on page 50.

OPERATING COSTS For air conditioned passenger trains have been reduced through installation of a compact dry-operating system for the Santa Fe's new fleet of forty-seven "Hi-Level" cars. The equipment was service-tested for a year on two experimental cars on Santa Fe trains. Description of the new equipment is included in the article on page 52.

FROZEN FOOD SALES continue their upward trend, the evidence now pointing to a sales volume for 1955 amounting to between 15 and 20 percent ahead of last year. This is the conclusion obtained from a survey of the National Frozen Food Distributors Assn. See page 56.

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The Centrifugal Compression of Ammonia

Application of Spinning Units to Large Tonnage Systems Results in Low First Costs, Minimum Space Occupancy, Little Maintenance, and Favorable Operating Overhead.

HARRY W. SHEDD
Eng., Gas Compressor Div.
Carrier Corp.

Harry W. Shedd

VERY probably — to a great many practical refrigerating engineers — the idea of applying machines that spin to the compression of ammonia vapors will be somewhat novel. However, it is a suggested practical application which has been in the back of many American engineers' minds for a long, long time. We may be sure that Dr. Willis N. Carrier considered ammonia (NH_3) as a possible refrigerant for the package type centrifugal refrigeration machine which he conceived back in the early '20's. Many refrigerants were investigated before finally settling upon the family of "Freon" refrigerants which are universally used today.

In this development, NH_3 had to take a "back seat"—so to speak—because it lacked some of the properties which centrifugal practice found desirable—such as high molecular weight and large specific volumes. However, in spite of the fact that the trend in the development of the packaged Centrifugal refrigeration machine was definitely away from the use of ammonia, it certainly remained in the back of many engineers' minds that NH_3 is an excellent refrigerant which is unmatched in many fields of application. Consequently, it comes as no surprise to *such* Engineers, to learn that the evolution process has reached full circle—not only is it *possible* to compress ammonia by centrifugal means—but the first installations in the U.S. have been made and are in operation.

Centrifugal Gas Compressor

Centrifugal gas compressors came into being early in this century being principally used to compress air. European engineers had done some work with centrifugals for other gases—among them *ammonia*. Then, as mentioned previously, in the early 1920's, designs were conceived by Dr. Carrier for the manufacture of centrifugal compressors for the specific purpose of forming one element of a "packaged" water or brine chilling refrigeration machine. These machines were first designed to utilize dielene as the refrigerant, then methylene chloride, and finally the family of "Freon" refrigerants such as "Freon-11," "Freon-12," and "Freon-114."

It was then only a question of time before the centrifugal was more universally applied to handle essentially all gases and vapors. World War II provided the necessary impetus to this program. The years 1942 through 1945 saw the design, manufacture and installation of centrifugal compressors for ethylene, isobutane, n-butane and sulfur dioxide.

Success of these installations in the synthetic rubber program, natural gasoline plants and petroleum refineries—and the many advantages which they provided over reciprocating machinery—provided the springboard for the general and wholehearted acceptance in these and other industries. Many additional installations were made and the field of application reached out to embrace other such media as oxygen, propane, methane, propylene, HCL vapors, methyl chloride, butylene, hydrogen, and various mixtures of gases.

A typical centrifugal gas compressor installation, such as might be used for an ammonia application, is pictured in Fig. 1. As compared with the package "Freon" centrifugal refrigeration machine compressor, the centrifugal gas compressor was designed to be universally applied with essentially all gases and vapors, light and heavy, under a wide range of volumes, pressure ratios and pressure conditions. In order to meet these requirements, families of special wheel designs were required. Provision had to be made to install as many as eight wheels on a single shaft. Heavier cases were required to withstand working pressures up to 1200 psig. These being a few of the problems which had to be considered.

Ammonia has two unfavorable characteristics which made it undesirable for centrifugal compression; namely, low molecular weight and low specific volume. In a Centrifugal Compressor, the number of wheels or stages required to produce a given compression ratio is inversely related to the molecular weight.

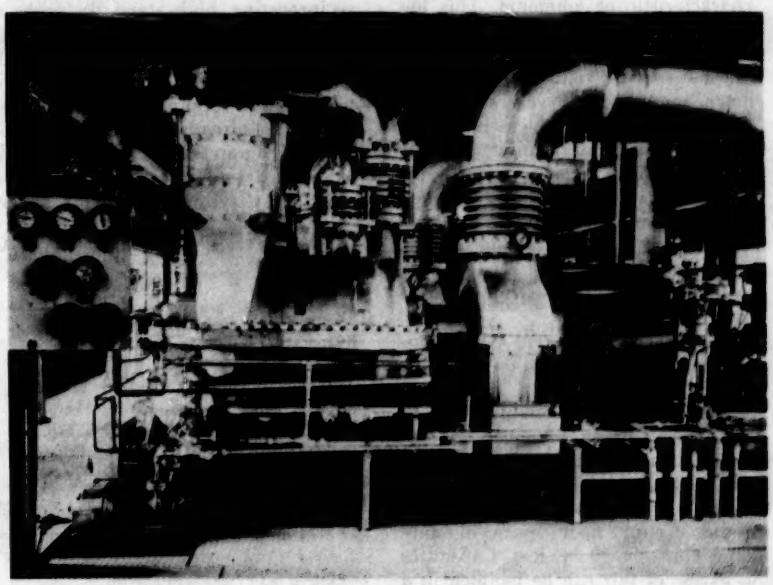

Fig. 1—Typical NH_3 Centrifugal Installation at a Hydro-carbon Chemical plant. Steam Turbine Drive Provides Favorable Overall Heat Balance for Power Plant.

TABLE 1—COMPARISON, REFRIGERANT CHARACTERISTICS AND COMPRESSOR STAGES FOR TWO SYSTEMS OF LIKE EVAPORATING AND CONDENSING PRESSURES.

Characteristics	System A	System B
Refrigerant	Ammonia	"Freon-11"
Molecular Weight	17	137
Evaporating Temperature	45F	45F
Evaporating Pressure (Sat.)	81 psia	7.88 psia
Condensing Temperature	110F	110F
Condensing Pressure (Sat.)	247 psia	28.09 psia
Wheels or Stages, Compr.	8	2

TABLE 2—COMPARISON, SPECIFIC VALUES OF NH_3 AND "FREON" UNDER IDENTICAL EVAPORATING AND CONDENSING CONDITIONS.

Refrigerant	Ammonia	"Freon-11"
Evaporating Temperature	45F	45F
Condensing Temperature	110F	110F
Heat of Vapor @ Evap. Temp.	624.1 Btu/lb	97.5 Btu/lb
Heat of Liquid @ Cond. Temp.	167.0 Btu/lb	30.3 Btu/lb
Refrigerating Effect*	457.1 Btu/lb	67.2 Btu/lb
Specific Volume @ Evap. Temp.	3.61 Cu.ft./lb	4.9 Cu.ft./lb
CFM/Ton of Refrigeration (200 x Sp. Vol.) / (Refr. Effect)	1.58	14.6
CFM for 700 ton Application	1106	10,220
Practical Minimum Capacity Limit	700 Tons	75 Tons

*Economizer not figured.

To cite a specific example, presume that a refrigeration cycle exists in which it is desired to produce an evaporating temperature of 45F, with a condensing temperature of 110F. Compare for a moment in Table 1 what this means—from the compressor standpoint—if this job is done with ammonia as the refrigerant, or with "F-11" as the refrigerant.

Today, centrifugal compressors are manufactured with adequate number of wheels. Back in Dr. Carrier's early development days, it was highly desirable to make the Centrifugal machine as simple as possible so as not to pose additional, and at the time difficult, mechanical design problems.

Minimum Capacity Limitation

There still remains one major factor which limits the universal use of centrifugal compressors on all ammonia applications, regardless of size. This is the low CFM/ton of refrigeration which is an inherent characteristic of ammonia. This low CFM/ton is the result of: *one*, the high latent heat property; and, *two*, the low specific volume. Table 2 sets down some specific values to show exactly what this problem is:

The centrifugal compressor is by its very nature a large volume machine, and its efficiency is very good with large volumes. From one aspect, this is extremely good! It means that a tremendous amount of refrigeration can be handled in an extremely small package.

For example, close to 3,000 tons of ammonia refrigeration can be handled in a centrifugal compressor occupying a plot of roughly 5 x 7 ft. A turbine driver for such a unit might occupy roughly the same floor area. Thus, a 3,000 ton ammonia refrigeration compressor and driver would occupy floor space of only approximately 70 sq. feet. Capacities in excess of this can be handled in a single large size centrifugal machine. For large systems, then, the centrifugal compressor cannot be matched.

This voracious appetite of the centrifugal has only one drawback. It is not practical to use it on the small applications. To be specific in defining the term *small*, the centrifugal as it is designed today, has a practical lower capacity limit of approximately 700 *tons* when using ammonia as the refrigerant. Eventually as smaller, higher speed compressors are designed, this lower limit will be reduced.

This nominal value of 700 *tons* requires some explanation and qualification. *Seven hundred tons* applies to a system going all the way up to normal *water condensing* similar to the example shown in Table 2; that is, with 45F evaporating temperature at 110F condensing temperature.

Minimum Capacity As Booster

In cases of a staged system, a centrifugal compressor could be used as the low stage unit together with a reciprocating high stage. In such a case the centrifugal could be used for capacities down to about 200 tons, depending upon the temperature level. Several applications of this type have already been made. Centrifugal compressors have been added as booster units for an existing reciprocating system to provide lower evaporating temperatures and/or increased capacity.

Table 3 indicates what happens when a low stage booster compressor is installed to provide 0F evaporating temperature discharging into an existing reciprocating installation operating at an evaporating temperature level of 45F. On booster applications, as the temperature level is decreased, the practical lower capacity limit of the centrifugal likewise reduces.

Table 1 illustrated a high temperature level ammonia application, which required eight wheels to go from 45F evaporating to 110F condensing—a 65F saturated temperature lift. This is equivalent, of course, to approximately an 8F saturated temperature lift per wheel. Refer to the booster application (Table 3) which has a 45F saturated temperature lift. Six wheels are required to do the job. Here the temperature lift per stage is again close to 8F.

Rule On Temperature Lift

From this may be obtained one *rule of thumb*: *that one centrifugal stage will provide approximately 8F saturated temperature lift when compressing ammonia.* Thus, an ammonia application which requires a 60F

TABLE 3—TYPICAL CHARACTERISTICS OF CENTRIFUGAL COMPRESSOR APPLIED AS BOOSTER.

Refrigerant	Ammonia
Evaporating Temperature	0F
Evaporating Pressure (Sat.)	30.4 psia
Discharge Pressure (Sat.)	81.0 psia*
Approximate Number of Wheels or Stages	6
Heat of Vapor @ Evaporating Temp.	612 Btu/lb
Heat of Liquid @ Condensing Temp.	92 Btu/lb
Refrigerating Effect**	520 Btu/lb
Specific Volume @ Evaporating Temp.	9.12 Cu.ft./lb
CFM/Ton of Refrigeration (200 x Sp. Vol.) / (Refr. Effect)	3.52
CFM for 275 ton Application	970
Practical Minimum Capacity Limit	275 Tons

*Corresponding to 45F.
**Liquid taken from High Stage Evaporator.

evaporating temperature and a 100F condensing temperature (40F total saturated temperature lift), divide by 8F and it will be seen that 5 stages, or wheels, are needed.

On booster applications, it has been indicated that the practical minimum capacity limit is 275 tons, at which point the compressor intake volume in CFM is 970. On high temperature level applications, it has been indicated that the practical minimum capacity was 700 tons, at which point the compressor intake volume was 1106 CFM.

NH_3 Compression Rule

Like the total saturated temperature lift, these figures are indicative. For any bonafide application of a centrifugal compressor *for ammonia compression, there will be needed a minimum suction volume at the compressor intake of somewhere between* 900 *to* 1100 *CFM,* 1100 CFM being required when using the maximum of eight wheels and 900 CFM being needed when, say, four wheels are required.

These figures will apply irrespective of the evaporator temperature level involved. Thus, whether the evaporator temperature be 45F, 0F, or minus 45F, if eight stages are required (equivalent to a 64-65F temperature lift), there must be a minimum intake volume of 1100 CFM. In addition to the relatively high level ammonia refrigeration system (roughly 45F and above) and the booster type of application, there is also the low temperature application going all the way to water condensing.

As mentioned, there is a practical limitation to the number of wheels or stages which may be located on a single shaft. Roughly, the maximum number of wheels is *eight.* Such considerations as critical shaft speeds are the determining factors.

From Table 1 it will be noted that eight wheels were used in going from 45F up to 110F condensing. So, how is a low temperature application handled? It is done in the obvious manner; two compressors in series with respect to gas flow.

Table 3 indicated that six stages are required to go from 0F evaporating up to 45F in a booster application. Thus, to go from 0F evaporating to 110F condensing, combine a low stage compressor having six wheels with a high stage compressor of eight wheels, making 14 wheels in all. Another combination could be 7 wheels in each compressor.

For temperatures below that which it is possible to obtain with two compressors, then a system consisting of three, or even more, compressors can be applied. Bear in mind, however, that whenever normal *water condensing* is encountered the system should have a capacity of at least 700 tons in order to do the job all the way with centrifugals.

It will probably be of interest to know that with a staged system, it is not always necessary (although it may be desirable) to furnish each compressor with its own individual driver. In fact, there are installations wherein two compressors are coupled together, end-to end, with a single driver which drives one compressor through the other one.

Typical Centrifugal NH_3 Cycle Without Economizer.

Examine Fig. 2, a schematic flow diagram showing a typical ammonia cycle with centrifugal compression. This particular cycle covers a 1,000 ton refrigeration system with an evaporating temperature of 45F and a condensing temperature of 110F.

For simplicity sake, pressure drops between the evaporator and the compressor suction, and between the compressor discharge and the condenser have been neglected. The refrigerant flows in lbs/min. are shown, as well as the pressure and temperature conditions in the various parts of the system. Note total ammonia flow circulating in this system since a comparison will be made later on. This volume is 438 lbs/min. in all parts of the cycle.

One fact of interest to note is that Fig. 2 shows no suction gas superheater before the compressor intake. With centrifugals, this is standard practice irrespective of the evaporator temperature level involved. It is followed even at sub-zero temperatures.

To illustrate, one installation involves a suction temperature of minus 180F. While this job involves ethylene and not ammonia, it does demonstrate that ultra-low temperatures entering the compressor do not pose any special problems (other than proper materials) where a centrifugal is involved. Of course, slop-over of free or entrained liquid into the compressor is to be avoided. This is handled inexpensively by means of a knockout drum, which also serves to separate out any foreign solid materials.

With centrifugal compressor, the gas or vapor being handled is not brought into close proximity with the lubricating oil. As a result there is no problem due to oil freeze-up or impairment of the lubricating qualities.

Since the suction gas superheater is not used, it follows naturally that there is no need to figure a resultant pressure drop in calculating the horsepower equipment. Although this particular cycle covers a system of 1,000 *tons* refrigeration capacity, and the compressor is eight stage, the horsepower requirement is 1074 *HP* or approximately 1.07 *hp/Ton.*

Economizer Equipped Systems

Engineers familiar with centrifugal practice have probably noticed that Fig. 2 did not include an economizer or liquid flash chiller in the cycle. Since a centrifugal consists of a series of stages, it is possible to provide one or more side connections in the compressor, through which gas can be taken into some intermediate stage. This feature makes it possible to utilize a liquid flash chiller in the liquid line between the condenser and the evaporator.

Fig. 3 illustrates the same system with the addition of a flash chiller, or economizer, as it is customarily called. This vessel cools the liquid coming from the condenser at 110F to an intermediate temperature of 79F by means of self refrigeration; the flashed vapors being drawn into a side connection on the compressor, which in this instance is located so that it introduces the flashed gas directly into the fifth stage wheel. This 79F temperature, of course, corresponds to the pressure of 150 psia which exists at the intake to the fifth stage.

The result is an improvement in cycle efficiency with a consequent horsepower saving. This saving is effected since less refrigerant has to be compressed through the entire pressure range (407 lb/min. vs. 438 lb/min.). The balance of the refrigerant (31 lb/min.) has only to be compressed through part of the compression range. Note that the horsepower is reduced to 1043 hp, for the same amount of refrigeration. This is approximately a 3% saving in horsepower.

Thus, in the case of an ammonia refrigeration application, a careful study should be made to determine if the saving in operating cost which results from the reduced horsepower, justifies the additional first cost investment of the economizer. Of course, horsepower can also be saved by increasing the surface in the evaporator and condenser. This should also be compared with the economizer cost.

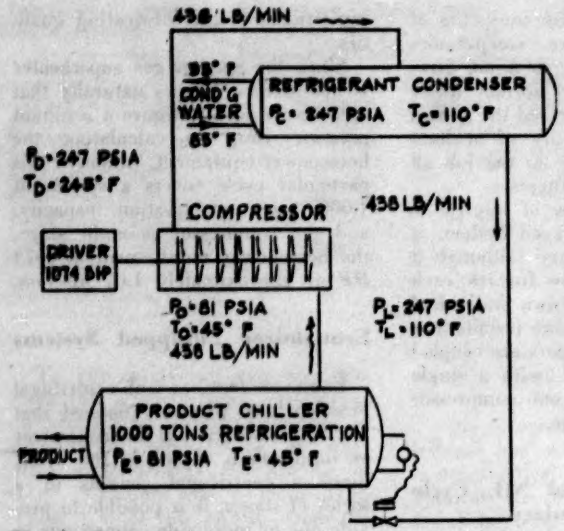

Fig. 2—Schematic of usual NH_3 Centrifugal Refrigeration Cycle. Note that each stage of Compression Is Approximately 8F and 21 PSI Rise.

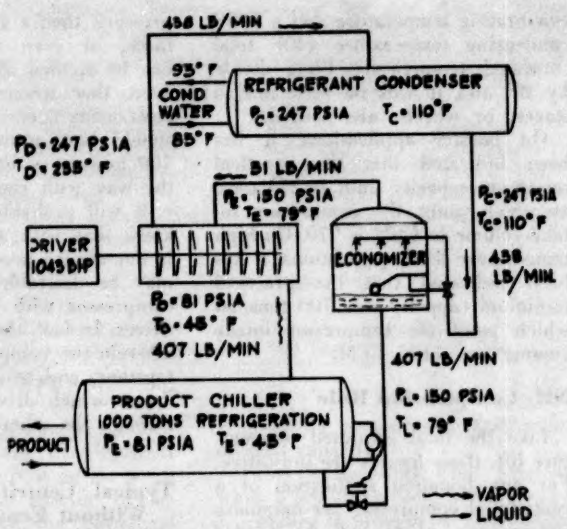

Fig. 3—Economizer Is Added to Schematic of Fig. 2. Note Reduction in HP of Driver Accomplished by Self Sub-Cooling of Liquid.

More Existing Installations

Following are some of the ammonia installations which have been made: One of the first was a single compressor for a booster type of application. This unit was installed in the Monsanto Chemical Company plant at Nitro, West Va. It is a five wheel compressor driven by a 600 hp motor through a speed increasing gear. This unit compresses from an evaporating temperature of 11F up to a discharge pressure of 91.7 psia, corresponding to a saturated discharge temperature of approximately 51.5F. The gas then goes up to water condensing range through reciprocating second stage. This unit has proven very satisfactory.

There are a number of possibilities in this *booster type of application. First,* and most apparent, it permits lower temperature operation without major modification to the existing basic system. *Secondly,* the NH_3 centrifugal compressor booster could also be used where additional capacity is required on an existing reciprocating system which is powered right up to the hilt. *Third,* sometimes lower temperatures are required concurrently, although such would not necessarily have to be the case.

To provide the additional capacity, the existing reciprocators could be operated to handle additional ammonia weight flow for the same horsepower input, by raising the suction pressure on these units. A centrifugal booster would take up the slack, boosting from the original evaporating pressure, or a lower evaporating pressure if desired, up to the new reciprocating system suction pressure.

Another installation of interest is at Canada Packers, Toronto, Ontario. This installation has both a booster compressor installation, and a drive-through staged compressor installation. The booster compresses from an evaporating temperature of minus 28F (corresponding to a suction pressure of 14.7 psia) up to a discharge pressure of 34.7 psia (approximately 5.5F). It is a five wheel compressor requiring approximately 221 hp. This unit is motor driven.

The drive-through compressor installation consists of an eight wheel low stage unit compressing from 30.4 psia at the suction (0F evaporating) up to 130 psia (70.5F) at the intermediate pressure. The high stage machine takes the ammonia at 130 psia and compresses it on up to 214.7 psia (101F) where it is condensed in water cooled condensers. The high stage compressors has four wheels. This drive-through unit operating in parallel with existing reciprocators, has a total requirement of 1700 hp which is furnished by an electric motor and gear.

Rath Packing Company at Waterloo, Iowa has a single compressor installation which is furnished with low temperature well water at 55F for condensing. The NH_3 condensing temperature is 81.5F which corresponds to a compressor discharge pressure of 157.5 psia. With this low discharge pressure, a single eight-stage compressor is capable of producing an evaporating pressure of 5F corresponding to a suction pressure of 34.0 psia.

This unit provides 550 tons of refrigeration (the 700 ton minimum limit previously mentioned for water condensing does not apply, due to the unusually low temperature water being furnished in this case) and requires 967 hp which is furnished in this case by a steam turbine driver. A centrifugal lends itself readily to either motor or steam turbine drive. The latter case provides the opportunity of working out the most economical steam balances for the particular plant.

Other installations are at American Cyanamid where a turbine driven drive-through unit is employed, and at Schlitz Brewing Co. which is utilizing both booster and direct compression.

Centrifugal Construction

Practical engineers who are not completely familiar with the centrifugal compressor, may care to briefly review the basic and principal parts, and the theory in back of its operation, as follows (see Fig. 4): *one,* a stationary element; and *two,* a rotating element.

The rotating element consists essentially of:

1. A forged steel shaft, on which are mounted:
2. The wheels or stages, which provide the impetus to cause flow and pressure increase through the machine;
3. A balancing piston, provided to partially equalize thrust;
4. A thrust disc;
5. Two journals, one on each end; and

6. On the end, a flexible coupling through which the driven power is imparted.

The stationary element consists of:

1. The shell or case, usually of cast iron or cast steel;

2. A series of diaphragms, intake wall and discharge wall, which when assembled in the case, form the various passages (diffusers and return channels) through which the ammonia or other gas flows from one stage to the next, etc.;

3. A set of inlet guide vanes, which when assembled with the diaphragms, direct the gas into the intake of the wheels at the same time imparting the desired pre-spin or rotation to the gas;

4. A pair of journal bearings, one on each end of the compressor, which support the shaft;

5. The stationary part of the double acting thrust bearing (Kingsbury type), which consists of two sets of shoes, one set located on each side of the thrust disc;

6. A series of labyrinths between the stages (referred to as interstage labyrinths);

7. A pair of shaft labyrinths, one at each end of the compressor which are used to separate the gas being compressed from the lubrication portion of the unit; and,

8. finally, but very important, the shaft end seal, located immediately at the point where the shaft emerges from the case, which provides the seal between the pressure of the gas inside the unit and the atmosphere.

Materials of Construction

A line of Centrifugal Compressors designed to be universally applicable to all gases and vapors must take into account the chemical properties of these fluids. Ammonia—and many other gases as well—is peculiar in its reaction to certain metals. For instance, the copper and copper alloys which are used in "Freon" machines have no place in ammonia compressors. Therefore, all parts of the centrifugal which come into direct contact with the ammonia are of materials other than copper and copper alloys.

Interstage and balancing piston labyrinths are aluminum and the rotating part of the shaft labyrinth is "free machining" stainless steel. The stationary part of the shaft labyrinths is cast iron with a pure lead lining. Because of its inert property, a lead coating is applied to the wheels which are basically steel forgings. A special contact type floating carbon ring seal, from which all copper parts has been eliminated, is used on ammonia applications. This same seal is used for practically all other gases, with atmospheric air being the one exception.

System Precautions Outlined

As with all machines, centrifugal or reciprocating, there are certain precautions to be observed during installation and initial operation. All piping should be carefully cleaned of rust, scale, sand and other foreign materials. If water has been permitted to accumulate in piping, it should be removed and the system dried out as thoroughly as possible. Piping should be properly designed so that there are no liquid traps which might cause flooding over into the compressor. A knockout drum in the suction piping at the compressor inlet is helpful in this regard.

While a centrifugal compressor will take a slug of liquid with much less detrimental effect than will a reciprocating machine, it is well to keep in mind that the centrifugal was *not* designed for this service. It is particularly important to note that only a little liquid entering the compressor suction will increase the weight flow tremendously. This can increase the horsepower requirement to the extent that it may cause the unit to "bog-down" in the case of turbine drive or to trip out on overload, in the case of motor drive. Appreciable amounts of liquid flowing into the suction of the compressor can cause excessive thrust resulting in damage to the thrust bearing, and possibly damage to other internal parts if the rotor shifts axially as a result.

Piping should be designed such that strains due to weight and to thermal changes are not imposed on the compressor and turbine equipment. Close shaft alignment is necessary on rotating equipment. This is impossible if piping forces are imposed on the units.

Advantages of Centrifugals Over Reciprocating Machines

Since the compression of ammonia has been handled in a reasonably satisfactory manner by reciprocating machines for a good many years, just what is to be gained by switching to centrifugals? Table 4 lists a few of the factors which favor centrifugals over reciprocators. Concluding, centrifugal compressors as they are applied to the compression of ammonia is not only a possibility but an actual accomplishment, as the number of operating units on this Continent will attest.

TABLE 4—ADVANTAGES OF CENTRIFUGAL COMPRESSION, NH_3 OVER RECIPROCATING EQUIPMENT.

1) Low First Cost/Ton, or /HP.
2) Low Cost of Erection
   a) Minimum Foundation Requirement
   b) Piping Simplified
3) Low Weight/Ton, or /HP*
4) Minimum of Vibration*
5) Minimum Space Requirement/Ton, or /HP.
6) Low Maintenance Cost
   a) Minimum Wear on Parts
   b) Essentially No Oil Makeup.
   c) Exchanger Surfaces Not Fouled by Oil in Circulation.
7) Favorable Steam Balances with Turbine Drive.

* Unit can be installed on upper floors.

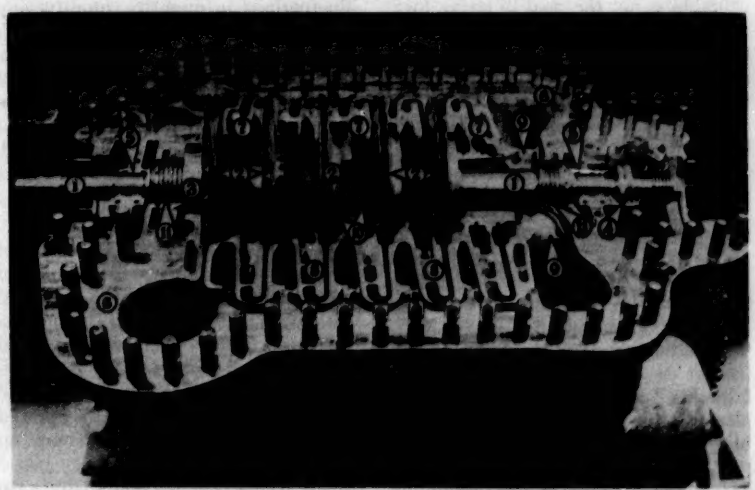

Fig. 4—Five Stage NH_3 Centrifugal Compressor With Top Casing and End Seals Removed. 1) Shaft; 2) Wheels; 3) Balance Piston; 4) Thrust Disc; 5) Journal and Bearing; 6) Casing; 7) Diaphragm; 8) Return Channel and Diffuser; 9) Inlet Guide Vanes; 10) Interstage Labyrinths; and 11) Shaft Labyrinths.

Retaining the Quality of Fishery Products

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Fishery products are, at the time of harvest, more susceptible to loss of quality and spoilage than the land animals used for high protein food. The preservation of top quality is possible through the combined and continuing efforts of the fisherman, the shore processing plant operator, the refrigerated warehouse operator, the transport services, the retail store operator and the consumer. Losses in quality sustained at any point along this line cannot be made up again.

The adequate, timely and proper use of ice is an important, but often neglected, means for protecting fishery products. The assistance of mechanical refrigeration to supplement ice is strongly to be recommended, both at sea and ashore.

The current trend to consumer packages, and to more highly processed products, as breaded and precooked fish or shrimp increases the processor's responsibilities for a quality product, but, at the same time enables him to use every available technical advance in processing, packaging, freezing, frozen storage and sales engineering. The advantages gained by full exploitation of these assets cannot be too strongly stressed.

THE major portion of the commercial production of fish cannot be delivered to the consumer's door in the desirable state of freshness without the assistance of refrigeration. The increased distances to profitable fishing grounds and the location of potential fish consumers at points hundreds of miles inland from the landing ports make the availability of fresh fish at competitive prices a difficult problem. However, with the current knowledge of refrigeration, the consumer can get, and is certainly entitled to demand, frozen fishery products that are not more than a shade behind the freshly-caught counterpart in the quality factors of appearance, aroma, flavor and texture.

The methods used in the chain of handling fishery products from point of capture by the fisherman to the ultimate consumer's table are the determining factor in guaranteeing the high quality the consumer has a right to expect. At each stage in the capture, preparation, freezing, frozen storage, transportation and cooking of fish, the "weak link" may be introduced that results in an "only fair" or even "unsatisfactory" product. A concerted effort by each of these persons to apply the most effective methods of quality preservation will strengthen the chain.

The offering of fishery products to the consumer that are just barely acceptable is not the goal to strive for; rather it's a fish, oyster or shrimp that retains a maximum of the characteristic aroma, flavor, texture and general palate satisfaction recognized by the connoisseur. Only then has the application of refrigeration fully met the challenge to surpass mere "preservation from spoilage."

Sea Products are Different

The crop harvested by the fisherman from the sea, differs in several important ways from the products of the land-meats, fruits and vegetables insofar as their adaptability as refrigerated commodities in the market place is concerned. With the possible exception of a few "captive" types, such as cultivated oysters, the harvest of the sea is susceptible to relatively wide and unpredictable fluctuations in quantity, quality, and exact season and locality of availability, most of which variables are outside the control of the fisherman. If we then add variations in the effectiveness of types of gear, supply of bait, and market price and demand, the picture is indeed a complex one.

Stages of Preservation

Visual and olfactory evidence of bacterial spoilage varies somewhat with each fishery product. Bacterial action on the fish, held under the best conditions of sanitation and temperature, usually follows a definite pattern. Poor conditions will cause the changes to speed up and overlap so that the stages may no longer be distinguishable.

As one example the changes in haddock may be cited. The first stage is that in which the characteristic odor of the particular species is gradually lost, but no objectionable or foreign odors are noticed. The time for this stage is from death to about five or six days and fish may be said to be accepted as fresh fish by all but the most discriminating consumer if it is to be eaten at any time within this period.

In the second stage, usually from the 5th to the 10th day, bacterial growth has gained enough headway to displace the neutral odor with successively more pronounced odors variously described as slightly sweet, musty, yeasty, sour milk and finally stale or slightly "fishy." The degree of desirability for eating decreases rapidly at this stage.

The last stage is that in which the by-products from the decomposition of protein and fatty tissues become dominant. Characteristic odors progress from definitely stale through sour, sulphide or rotten cabbage, ammonical and finally nauseating and putrid. Fishery products at this stage would be considered unfit for human consumption.

Rancid Odor

Fish of high oil content usually begin to develop a rancid odor, sometimes called a "saltfish" odor, which may be detected in the second stage. Exceptionally perishable species, as herring caught in summer with the stomach full of food, will spoil through combined enzymatic and bacterial action so rapidly that, even with the best iced storage and careful handling, the become spoiled in little more than 48 hours after capture. At the other end of the spoilage scale halibut carefully dressed and stored at 33 F in ice may retain their fresh qualities for as long as 15 to 20 days.

The third type of spoilage in fishery products results from the oxidation and rancidification of fat or oil. Fish are especially susceptible to this form of spoilage because they contain highly unsaturated oils.

The principal factors involved in the rancidity problem are exposures of the fish to an oxygen source such as air, temperature of storage, preservation of natural anti-oxidants in the fish, and presence of pro-oxidants that speed up the reaction. Other oxidative changes include: (1) the fading or other changes in the color of fish such as salmon; and (2) the development of off-colors, as the yellowing of halibut. This latter, usually referred to as "rusting", is due to the oxidation of oil in the

Paper presented at NARW-TRRF Training Conference, Edgewater Beach Hotel, Chicago, January 10.

surface layers or of that brought to the outer surface during frozen storage.

A fourth type of spoilage, perhaps more properly classed as a loss of desirable characteristics, is denaturation. This action is an irreversible change in the protein of the fishery product. The exact cause of denaturation is not yet established but we do note several changes to the product that lower it in quality.

Among the methods advanced to minimize the effects of denaturation are: (1) bringing to seal the exterior surfaces; (2) keeping the period from death to the freezing operation to a minimum; (3) keeping the rate of freezing as high as possible; (4) keeping the time in frozen storage to a minimum; and (5) keeping storage temperatures to the lowest practical level for the species involved.

Where Losses Occur

The principal causative agents in the loss of quality of fishery products have been described. It is next of importance to know when and where these losses occur. There are three main stages in the marketing chain of refrigerated fishery products: (1) in fresh-iced storage and transport; (2) during freezing; and (3) in frozen storage. Certain of the undesirable changes are, to a degree a problem at each stage, others occur at only one.

The fresh iced stage aboard the vessel is very important because the initial lag in enzymatic, bacterial and oxidative changes can be prolonged to the utmost or cut short, depending on the degree of care and icing.

When the iced products are brought to shore, the hazards of exposure to further contamination with bacteria and to the effects of increases in temperature are increased, especially if there is further preparation for market, as in filleting, sorting, boxing and reicing, storage and transport to the ultimate consumers.

During the process of freezing, several changes occur, some of which are beneficial, others not. On the plus side, bacterial action is slowed, and ultimately stopped when the temperature throughout the product reaches 0 F. Enzymatic deterioration of the protein is likewise checked, but not entirely stopped even at minus 10 to minus 20 F. Among the undesirable reactions attributable to freezing are the denaturation of or irreversible changes in the protein. The most noticeable characteristics of this reaction is the release of some of the liquids from the tissues when the product is thawed.

Other side reactions, that show up as the frozen storage period progresses, are the gradual loss of tenderness and development of off-flavors and odors. The dehydration of exposed surfaces of products in frozen storage results in a dry, spongy and discolored surface. Contact with air permits rancidity to continue, but at a slower rate, with the resulting rancid flavors and odors appearing in the product. The oozing of non-solidified oil from the tissues to the surface of the frozen fish makes possible the reaction with the air that, in addition to the rancid flavors and odors, causes the yellowing or browning of the fish referred to as "rusting". Fading of original color or development of an off-color takes place during frozen storage.

The care fishery products receive aboard the fishing vessel can, in large measure, determine the type and extent of undesirable changes in quality. This same problem is handed to the processor when the catch moves to the shore plant. Often the need for care is more urgent as even the minimum amount of sorting, washing, dressing, boxing, reicing or processing into fillets requires time. The fish may be exposed to temperature increases, additional bacterial contamination and rough handling.

Fishery products destined for sale on the fresh-iced market as landed should be handled only as necessary to establish their quality and to sort them for species or sizes. Even during unloading and preliminary handling icing should be as carefully and thoroughly continued as at sea. If the fish are to be boxed in ice, as for salmon and halibut, the boxed lots can then be put at once in a cooler (32 - 35 F) until transport to market begins. Fish to be dressed or filleted must likewise be iced pending processing. If supplies are in excess of plant processing capacity, the fish should be well iced and stored in a cooler.

At the present time large quantities of fish are marketed as fillets. Assuming that these fish have been adequately protected during their transport from point of capture to the point of landing, the measures for preservation of their quality during handling and processing ashore are next of importance. As the fish are removed from the vessel they should pass rapidly to iced storage ashore or immediate processing, with careful handling to minimize bruising or puncture of flesh. Thorough washing with city water removes accumulated slime, bacteria and loose scales.

Brining of the clean fillets briefly in a 5 to 15 percent salt brine assists in the sealing of the exterior surfaces of the fillets to loss of the liquid components upon thawing. The brine should be kept at 32 F and changed frequently to minimize bacterial load build-up. Chlorination of water for brine is initially helpful, but the heavy protein load from soluble protein and small detached particle of flesh soon use up the chlorine.

Freezing

The freezing of fillets approximately one inch in thickness, if properly done in a contact plate freezer, should not require more than one to two hours, preferably the former. Packaging must be such that little if any air voids remain on freezing; an intimate contact of fishery product and package surface reduces potential damage from dehydration and oxidation within the package during frozen storage. The packaging material must be moisture-vapor proof and tightly sealed to keep these undesirable reactions to a minimum.

In the case of small fish landed in the round condition, as mackeral, panning is a good freezing procedure. The thoroughly washed fish are frozen in pans (usually made of galvanized iron in dimensions of 16 x 26 x 3 inches deep) on pipe coil racks for a period of 12 hours or less, depending on the size of the pans, the size of the fish, and the temperature of the freezer room. After freezing is completed the block of fish is removed, completely glazed and packaged in a cardboard carton.

Freezing is accomplished in rooms at 0 to minus 10 F on pipe coil racks that will accommodate varying sizes of fish from 10 to 200 pounds. Some plants utilize blast freezing for these fish. Freezing should be accomplished as rapidly as possible to preserve quality. Glazing subsequent to freezing protects the fish against the effects of oxidation, rancidification and dehydration during frozen storage so long as the glaze is adequate and intact. Frozen storage should be at a minimum of 0 F, preferably at minus 10 to minus 20 F.

The quality of fishery products is determined largely by the care exercised prior to the packaging stage. The proper package can and should do three things:

(1) Maintain quality at very near the level the product had when packaged:

(2) Protect the contents from odor or flavor contamination in frozen storage and distribution channels;

(3) Act as a silent salesman in the retailer's cabinet.

First section of the Southern Michigan Cold Storage Co. plant near Benton Harbor, just before completion.

Fruit Freezing and Storage Service Provided by Michigan Cold Storage

RECENT construction of a large, two-story, modern cold storage plant is only the first stage of a one and a half million dollar venture, according to Carl Steimle, president of the newly organized Southern Michigan Cold Storage Company. First section of this refrigerated warehouse building was formally opened in July. Erected on a 10-acre tract located just east of the Pipestone Road-River Road intersection in Sodus township, near Benton Harbor, Michigan, the plant has been designed to serve as a quick freezing and sub-zero storage for frozen fruit and other frozen food products, and cold storage facilities for fresh fruit.

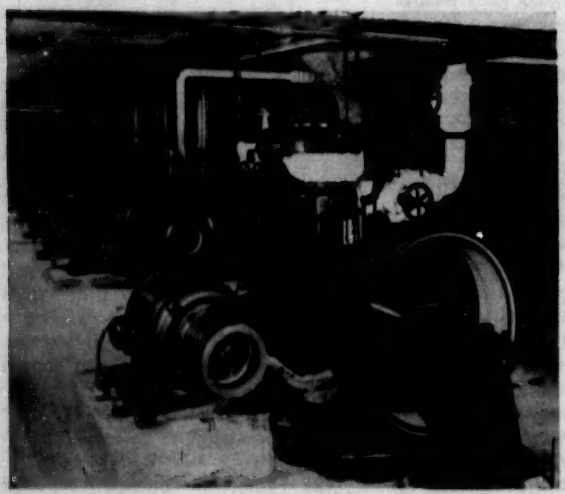
First section of the structure, 324 x 160 ft. with 16 ft. clearance under the coils, has a capacity of 870,000 cu. ft. Design arrangements make it possible to palletize 18,000,000 lbs. of foodstuff in the freezer storage. The Zero F storage room contains 6,440 lineal ft. of 2-inch Frick finned pipe; each foot having 5.5 sq. ft. of surface.

A freezer tunnel 40 x 45 ft. is located on the main floor (2nd level) in conjunction with the freezer. Freezing capacity at minus 30° F. will be 375,000 lbs. per day. This freezing is accomplished by use of six No. 685 Niagara blower "No-Frost" units. Each unit has a basic rating of 18,000 Btu/hr. with a delivery of 24,000 cfm of refrigerated air. A Niagara model No. A20E concentrator will dissipate the excess moisture picked up in the circulated air of the freezer by the "No-Frost" liquid.

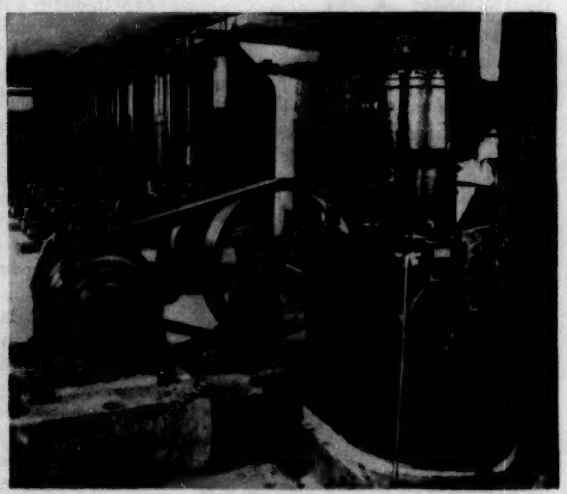
All construction photos courtesy of Pittsburgh Corning (Foamglas) Corp. and refrigerating equipment views by Hayes Bros., Inc., the Indianapolis & South Bend, Refrigeration Contractors.

Frick Compressing Equipment

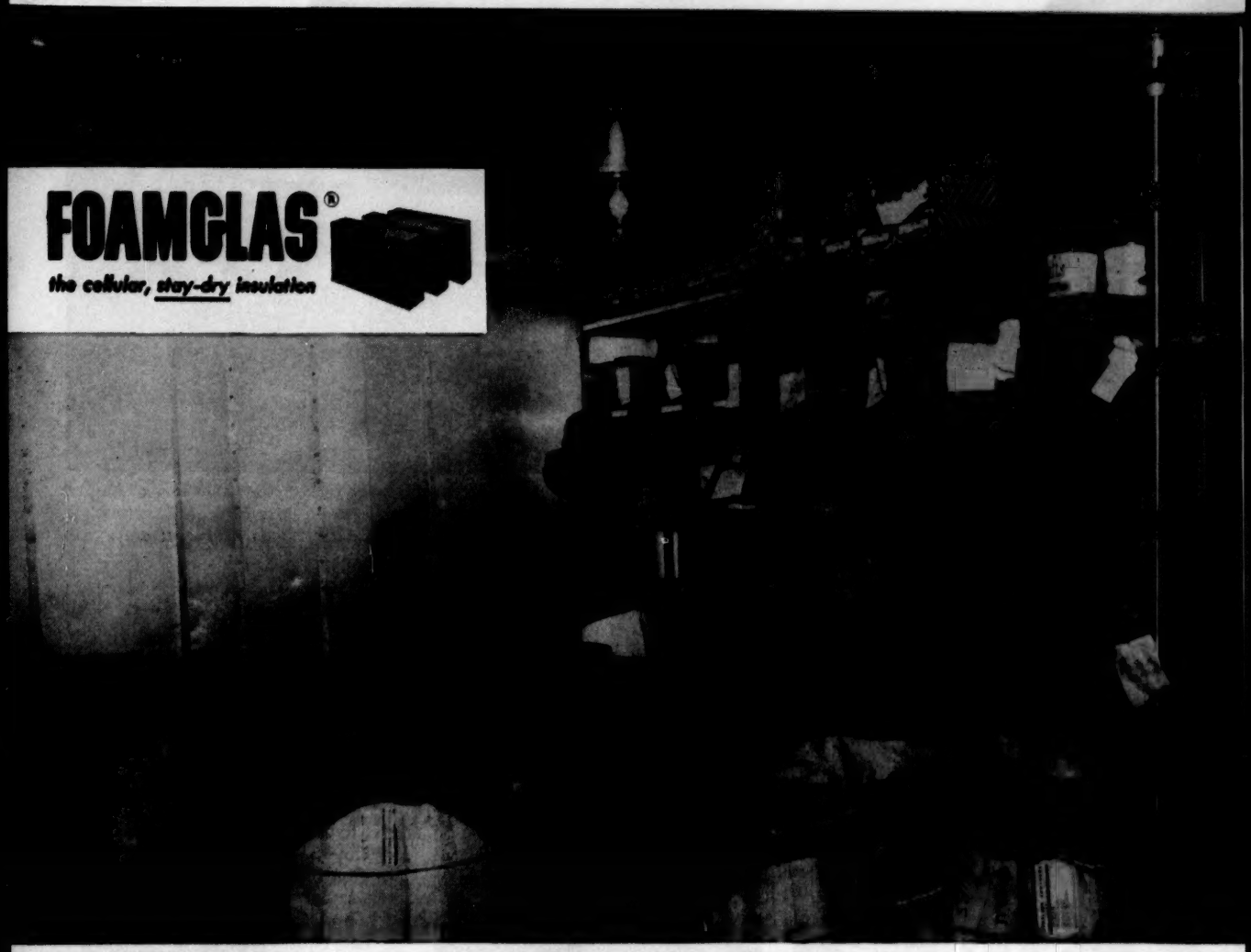
Compressors totalling 700 hp will enable the firm to maintain consistent design temperatures. The plant has two-stage operation. Five model No. PAB-1509 nine-cylinder 5-1/4 x 3-3/4 inch Frick "Eclipse" ammonia boosters at minus 40° F. suction and 30 psig discharge, rotating at 1,200 rpm., and one VSA 13-1/4 x 9 inch



Booster compressor battery at the new Benton Harbor plant, photographed at time of machinery trials, consists of one Frick 2-cyl. VSA 13¼ x 9-inch and five Frick "Eclipse" 5¼ x 3¾-inch 9-cyl. units.



High stage units arranged in the same machinery placement line (at the far end of Fig. 2), is composed of one Frick 9 x 9 VSA compressor and four type AHP 3½ x 4¼ "Eclipse" units.



"FOAMGLAS stays dry for constant, dependable insulating protection in our 14 coolers and freezers"

states John J. Bryner, Chief Engineer, New Orleans' Roosevelt Hotel

New Orleans' Roosevelt Hotel protects $80,000 worth of stored food with *stay-dry* FOAMGLAS . . . used to insulate 14 new freezers and coolers plus piping. Their recent expansion and modernization program, increasing diner capacity to over 3200, called for greatly increased cold storage space. Another insulation in their older refrigerated rooms had absorbed moisture and failed—so they switched to FOAMGLAS for the new construction.

John J. Bryner, the Roosevelt's Chief Engineer and past president of the National Association of Practical Refrigerating Engineers, says:

"Moisture in an insulation means trouble. It cuts efficiency, destroys insulating value. We use FOAMGLAS because its sealed glass cells can't absorb moisture. It gives us constant protection without expensive maintenance.

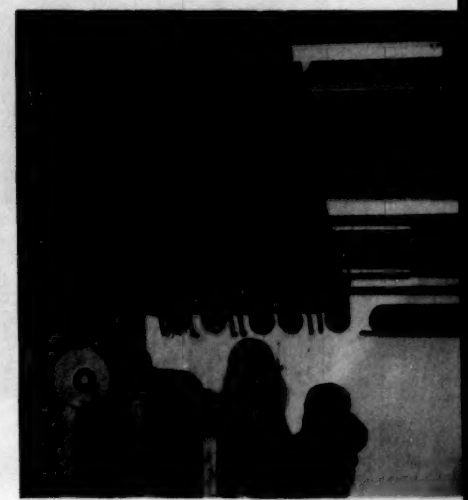
"Removing the moisture problem also helps prevent refrigerating odors in our stored food. Rodents are no problem since the insulation is vermin-proof."

Mr. Bryner concludes: "We've had perfect service from the FOAMGLAS we installed in freezers, coolers and on piping last November. We anticipate many years of maintenance-free insulating protection with it."

Take a tip from John Bryner and the Roosevelt Hotel. Let cellular, *stay-dry* FOAMGLAS give *you* perfect protection for your insulated spaces, piping and equipment. Write for a free sample and our literature containing complete details on this remarkable insulation.

Pittsburgh Corning Corporation
Dept. T-95, One Gateway Center
Pittsburgh 22, Pennsylvania
In Canada: 57 Bloor St. W., Toronto, Ontario

The Roosevelt's 14 coolers and freezers vary in temperature from −10°F. to +43°F. FOAMGLAS was applied in thicknesses of 4", 5", 6" and 8" depending on temperature requirements; finish is sheet aluminum. All exposed piping in the cold storage system is insulated with FOAMGLAS. Insulation Contractor: Eagle Asbestos & Packing Co., Inc., New Orleans



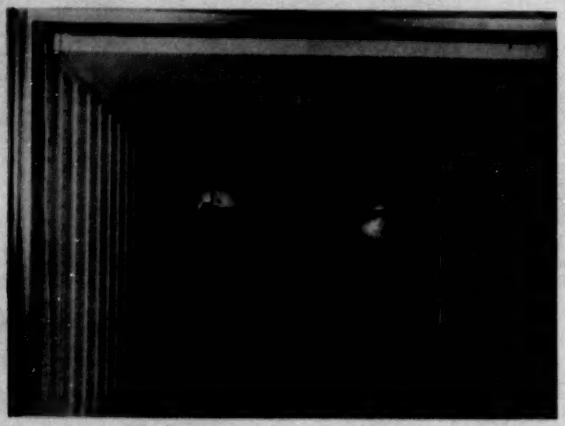


Fig. 4—One of six freezing tunnels, each capable of 62,500 lb. food freezing capacity to minus 30 F. Niagara's model No. 685 "No-Frost" type.

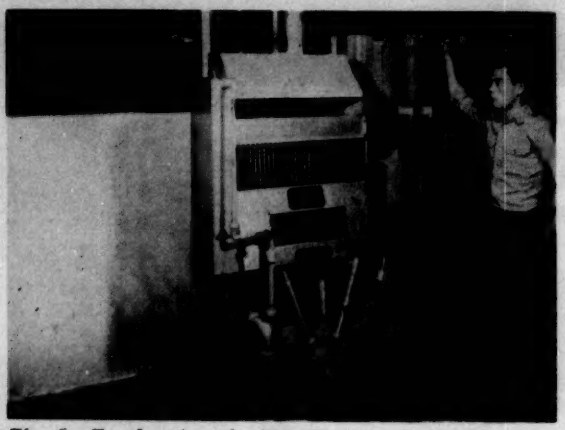


Fig. 5—For keeping the "No-Frost" solution at proper density and free of excess moisture, the system is equipped with an A20E Niagara concentrator.

Frick ammonia booster with zero-lb. suction and 35 lb. discharge, at 400 rpm make up the 1st stage battery.

Second stage consists of one 9 x 9 inch, 75 ton Frick ammonia compressor when operating at 154 psig discharge and 35 lb. suction, and four model No. AHP-489, 60 hp, 3-½ x 4-¼ inch "Eclipse" Nine-cylinder compressors which operate at same suction and condensing pressures. All are located in the 64 x 160 ft. engine room located in the first floor. Condensing water is from two deep wells, both 10 inch x 100 ft. deep, with 52° F. water.

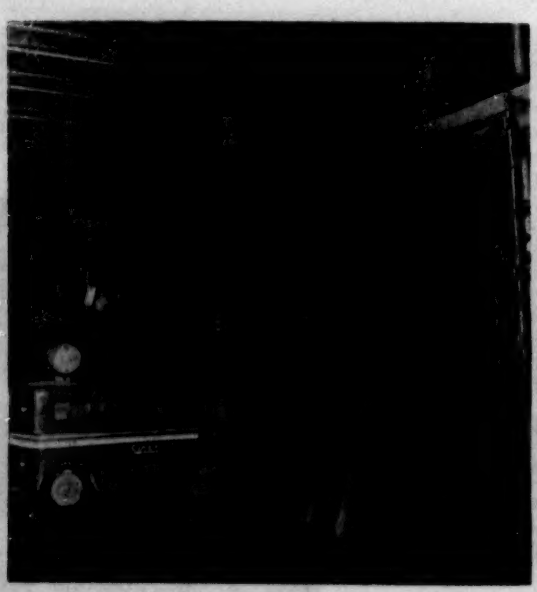
The huge freezer has four 6 x 8 ft. Jamison super-freezer doors opening onto the 324 x 30 ft. loading dock in the front of the building. The rear of the building also has two Jamison doors. All the doors have "Air-Lec" door operators. Each door is provided with a Jamison "Frostop" electric defroster. With this door arrangement, it is estimated that six Clark fork-lift trucks will handle the traffic volume of the freezer.

Fig. 6—Detail of Foamglas pad beneath column base plates. This construction enables the builder to carry a complete envelope of insulation around the low temperature area.

Load Bearing Foamglas Used

Over 5,000 yds. of concrete has gone into the footings, basement floor, piers, and structural slab of the first floor. The piers are spaced on 22 x 20 ft. centers. The 20 ft. long sections of the steel decking are set on bar joists which rest on steel columns.

The entire load of the steel roof structure including all columns, bar joists and decking, plus the Foamglas used on the roof, is supported on the Foamglas floor set on the structural slab. (Foamglas insulation has a compressive strength of more than 7



Left: Mechanized materials handling helped expedite construction phase. Insulation is placed on scaffold for wall placement near the roof.

Below: Roof insulation being placed. A three-ply roof and reflective chips was asphalted directly over the Foamglas.

Before and after views: (Left) Low temperature room. Floor insulation partially in place, with reinforcing mesh in the background, and a section of the Frick finned cooling coil awaits hanging and hookup; (Right) Start of warehousing operations in the same 0 F. storage, the floor now completed, the walls finished and painted, and the 7-inch square finned coils in service.

tons/sq.ft.). This proprietary design allows the entire freezer to be completely enveloped in 8-inch thickness of Foamglas, and provides that all structural steel is isolated from any masonry. The fresh fruit storage is insulated with four inches of Foamglas. All the insulation was set in hot asphalt.

Other than the engine room, the first floor of the building is devoted to fresh fruit storage of approximately 375,000 cu. ft. and normal temperature dry storage. The fresh fruit storage is designed to maintain 30 F. and will be refrigerated by two Frick 15003AU units. Each unit has a basic capacity of 12,180 Btu per hr. with a delivery of 15,800 cfm of refrigerated air.

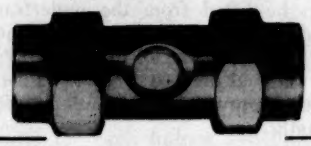
Grading-Inspection Offices

The main office for the company is located in one end of the second floor of the building. An office is also provided for the State Department of Agriculture's grading personnel. It is estimated there will be 25 or 30 workers employed in the

(continued on page 61)

SEE **INSIDE** YOUR REFRIGERATION LINES WITH THE NEW

LIQUID EYE®



INDICATOR

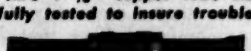
3000 SERIES (Illustration)

Other Allin "LIQUID EYE" styles and sizes are available for both ammonia & Freon applications.

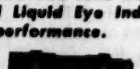
All feature:

- High pressure Pyrex sight glass.
- Pressure-sealed Neoprene Sealing rings at both ends.
- Unrestricted full line flow
- Ruggedly constructed of cadmium plated steel.
- Ideal for wide variety of applications.
- Available in ¾", 1" and 1¼" I.p.s. and ¼" thru 1⅛" tube sizes.

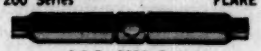
Same design in the 3000 Series with extended tube ends for ¾" thru 1-⅝" copper tube sizes. All Liquid Eye indicators carefully tested to insure trouble-free performance.



O.D.S. 200 Series



FLARE 100 Series

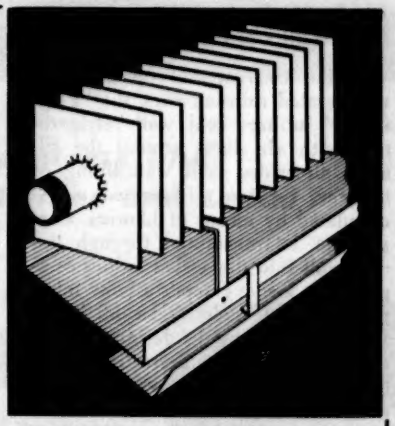


O.D.S. 2000 Series

Send for Catalog D-55 covering the complete Allin line.

Allin MANUFACTURING COMPANY
1153 W. Grand Ave., Chicago 22, Ill.

This new finned pipe is available in lengths of 5', 6'8", 10' and 20' — and with fin spacings of 1" and 1½" — to fit every application.



FRICK

Square-finned Pipe

Is ideal for cold storages, freezers, food processing and meat packing plants, etc. Manufactured from 2" dia. F.W. steel pipe and 7" square 14- gauge fins, Frick finned pipe gives maximum heat transfer per dollar invested. Each fin is bonded to the pipe under tons of hydraulic pressure. All assemblies are hot-dip galvanized.

These new Frick finned coils require only one-quarter of the space needed for bare pipe having the same surface. See your nearest Frick Branch or Distributor for complete details, or write for Bulletin 158.

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.

New Mechanical Refrigerator Car Based on Major Engineering Advances

FRIGIFRATER, a mechanically refrigerated railroad car that promises to be as useful a tool to the growing frozen foods industry as the Diesel locomotive has been to American railroads, was shown to the public for the first time at General Motors' big "Powerama" in Chicago August 31 to September 25 by the Electro-Motive Division of General Motors, designer and builder of the equipment.

The new car "Frigifrater" offers shippers a refrigerator car that requires little servicing, while maintaining any temperature between 10 degrees below zero and 65 above. "It is designed to expedite shipment of frozen fruits and vegetable and other perishables by means of several major engineering advancements in refrigerating equipment, insulating materials, and car body design," said N. C. Dezendorf, vice-president, General Motors, and General Manager of Electro-Motive Division, pioneer builder of Diesel locomotives.

View of new General Motors "Frigifrater", new type mechanical refrigerator car for railroad use, designed and built by Electro-Motive Division of General Motors. Car, which features cold wall cooling and humidification control, was exhibited at the General Motors Powerama at Chicago's Soldier Field August 31 to September 25.

Air Ducts Around Cold Wall Lining

Unlike conventional mechanically refrigerated railroad cars, the "Frigifrater" utilizes cold wall refrigeration with air ducts around the all-steel, all-welded cold wall lining of the car. Captive refrigerated air is circulated by means of blowers. Cargo heat is transmitted through the cold wall into the sealed lading compartment keeping foodstuffs or other products both moist and cold, it has been explained by the designers. Dry, captive air also cuts defrosting cycles to once every seven days instead of daily, as required in present mechanical-type refrigerator cars.

The usual Detroit Diesel engine and Delco Products induction generator power unit for the Frigidaire refrigeration system has been redesigned by Electro-Motive engineers to eliminate many relays, voltage regulators, starters, charging generators and other electrical items, simplifying the system and providing a more compact unit with minimum servicing requirements.

Insulation between the car body and the inner cold wall is provided by six inches of an inorganic foam of isocyanate, which bonds itself to both surfaces and adds greatly to structural strength of the car. This material will not pack down, even under great pressure nor absorb moisture, thus preventing corrosion of hidden steel surfaces.

An important feature of the "Frigifrater" in actual operation over the rails is the separation of the car body from the rugged steel underframe, according to Dezendorf. Fiber supports and cushioning devices permit the car body to slide freely over the underframe, within practical limits, thus protecting the car body, refrigeration equipment and lading from damage of impact inertia caused by slack action of the train or in the usual bumping that occurs in normal yard switching operation, he said.

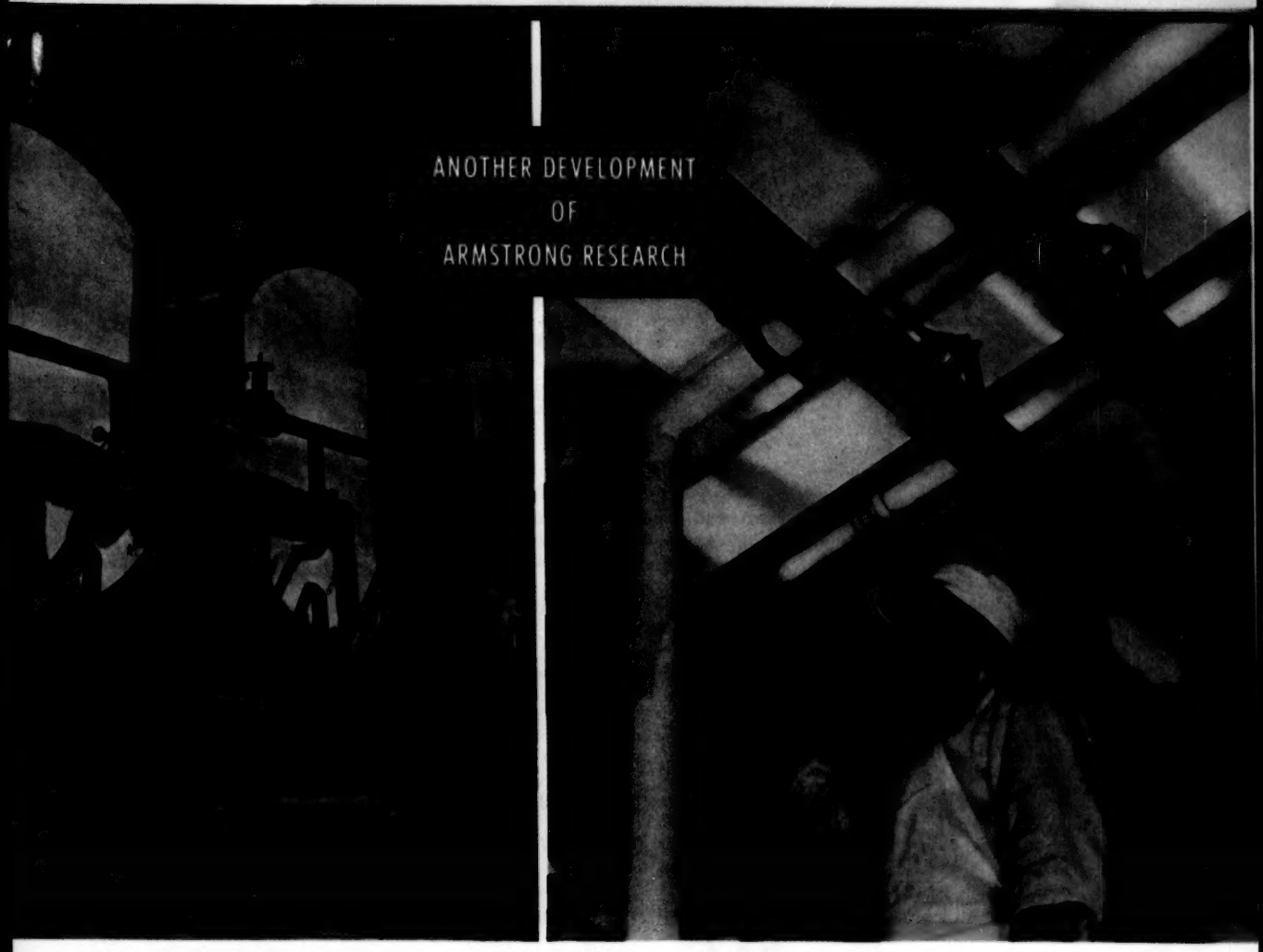
A further boon to shippers is the novel door arrangement which permits speedy loading and unloading of the lading by automatic fork lift trucks. Conventional cars, in order to keep refrigeration loss to a minimum, have been built with four foot doors, too small for fork trucks. Dezendorf pointed out that the old style reefer doors must swing outward to open, creating clearance problems at loading platforms. The "Frigifrater" is equipped with doors of glass reinforced polyester resin that swing out only 13 inches, and then roll back along the side of the car providing an eight-foot wide opening. Special locking devices and insulation prevent refrigeration loss.

The "Frigifrater" is constructed so that the entire refrigerated unit can be lifted from the underframe and transported, in full operation, by shipboard, an obvious advantage in national defense. The car is being manufactured in 40 and 50 foot lengths.

While designed especially to transport frozen foodstuffs, the car, because of its excellent humidification control, can be used to advantage in shipping certain metals and other products, edibles and non-edibles where humidity control is an important factor.

Dairy Surpluses Declining

AMERICAN Dairy Association reports that Commodity Credit Corp. economists believe that dairy surpluses are nearing an end. Increased consumption, sales promotion and population growth are listed as the main causes of the decline. ADA says it is putting $5,000,000 in their sales campaign this year and expects to double that in the near future.—NARW Cold Facts



Insulcolor . . . *tough plastic finish protects and color codes insulated lines and tanks*

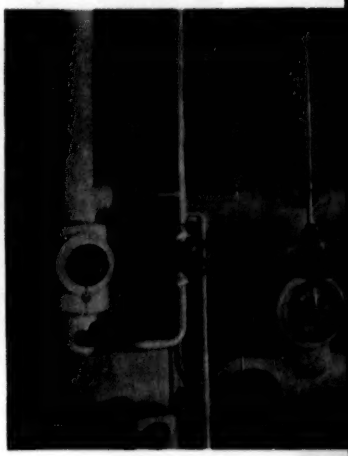
On both indoor and outdoor installations, you can be sure of long-lasting protection with this rugged insulation finish. And the durable plastic Insulcolor® coating not only protects insulated lines, tanks, vessels, ducts, and cold rooms, but serves as color identification, too.

Available in a choice of seven colors and white, Insulcolor furnishes a smooth, good-looking finish. It will withstand a wide range of temperatures and severe outdoor conditions without cracking, crazing, or peeling. Bumping or abrasion will not damage Insulcolor's tough plastic surface, and Armstrong Insulcolor is both fire resistant and moisture resistant, too.

Insulcolor is quickly and easily applied by brush or spray gun. An application lasts many years with little or no maintenance. Dirt, grease, and soot are readily washed off the smooth Insulcolor surface.

One of many products developed by Armstrong Research for the industrial insulation field, Insulcolor is readily available through the Armstrong Contract Service. Get full details on Insulcolor and the Armstrong Contract Service from your nearest Armstrong office. For your copy of the free 32-page booklet, "Armstrong Industrial Insulations," write today to Armstrong Cork Company, 209 Stratton Street, Lancaster, Pennsylvania.

Armstrong INDUSTRIAL INSULATIONS



Because Insulcolor color codes, as well as protects, it eliminates the bother and expense of stenciling or painting insulated lines with an identifying color after the finish has been applied.

Dry Wall Construction Used in New Food Processing Plant

DRY WALL insulation construction for refrigerated rooms figured importantly in the Consolidated Foods Corporation's food processing facility in River Grove, Illinois, recently completed. Exterior walls of the two cooler rooms in the main building were completed with four-inch thicknesses of Fiberglas insulation. Three-inch thicknesses of the Fiberglas insulation were applied to each of two adjoining partitions separating cooler compartments.

In a smaller and adjacent produce building, a unit containing a cooler room and two future freezer rooms was constructed. Four-inch thicknesses of insulation were applied in all walls of the cooler room. For walls of one future freezer compartment four-inches thickness was employed in interior walls and the exterior wall completed with a six-inch thickness. The remaining future freezer space had an exterior wall with an eight-inch thickness, two with six and the fourth with four.

Principles of dry wall construction used were: The walls were sprayed with an emulsified asphalt adhesive into which was pressed a vapor seal paper lapped three-inches (See Fig. 1). Then the entire surface was covered with the adhesive. Wooden girts, treated to prevent rot and decay were nailed horizontally and vertically to the masonry wall. Fiberglas insulation boards then were pressed into place to the desired thicknesses between the girts. Walls were finished with perforated and solid masonite hardboard.

A suspended ceiling was constructed over cooler and freezer rooms at Consolidated. Fiberglas asphalt-enclosed board was installed on suspended tee bars which were set 18-inches apart. The first layer of the board was notched to fit the tee bars which are 2 x 2 x 1/4 inches. Notched ends resting on flanges of the tee bars were set in hot asphalt which was also applied to the top of the first layer and to the underside and edges of the second layer. Thicknesses of insulations in ceiling areas were: four inches over the coolers, six inches over the small freezer space and eight inches over the larger freezer room.

Refrigeration and Accessories

Air conditioning of the warehouse and office buildings is accomplished by use of two 50-hp Worthington compressors, one 100-ton Marlo evaporative condenser and Marlo direct expansion coils in a multi-zone air distribution unit. The unit is also equipped with Marlo non-freeze heat coil. Control is through Minneapolis-Honeywell electrical devices.

The produce coolers are refrigerated by two 15-hp water-cooled Worthington condensing units, cross-connected to 6 Marlo propeller type produce coolers, arranged three per room. The coolers are equipped with electric strip heaters for humidity control. Banana rooms in the produce building are refrigerated by one 10-hp Worthington condensing unit. The three rooms are equipped with Krack coolers with electric reheat for banana ripening.

Cork Insulating Company, Chicago, was the insulation contractor. They provided and installed Series 50 Jamison doors, completely metal clad vestibule types, with bandit releases. Fruit Dispatch Corporation provided the specifications for the three banana rooms and their equipment.

A. Epstein & Sons, Inc., architects and engineers of Chicago, who drew plans and specifications for and supervised construction of these two projects, have used this insulating method on several of their projects. The new method was developed and pioneered by Owens-Corning Fiberglas Corporation.

Dry wall construction, according to Owens-Corning representatives, provides a nearly perfect vapor barrier without the need for hot asphalt. The hazards of fire and other dangers attendant to keeping asphalt hot and hoisting it to the scaffold are avoided. Substantial savings are realized and easy maintenance is possible as the finish and insulation can be removed for repairs without damage.

Fig. 1—First step in installation of Fiberglas insulation in freezer and cooler rooms of the Consolidated Foods Corporation's new plant at River Grove, Illinois, is spraying of an emulsified asphalt adhesive on the masonry wall. A vapor seal paper is pressed into adhesive, lapped 3 inches and surface sprayed with asphalt.

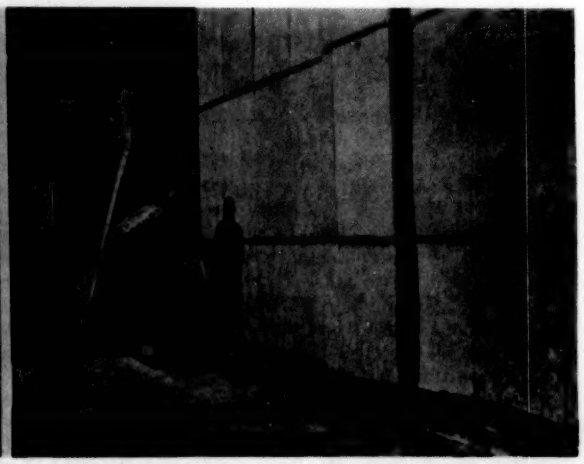


Fig. 2—Second step in the new dry wall method of installation involved successive layers of two-inch thickness of the Fiberglas insulation pressed between wood girts. The girts, treated to prevent decay and rot were nailed horizontally to the masonry wall 47-3/4 inches apart and vertically at intervals of about 23-3/4 inches.

Practical Refrigerating Engineer

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

Service and Operating Tips for Towers and Evaporative Condensers

ECONOMY of operation, compliance with local regulations, and water conservation have projected the use of cooling towers and evaporative condensers into the refrigeration and air conditioning design picture. Selection of the unit, its installation, and operation by the practical man, are as important as its design and intended use. Observance of the manufacturer's service and operating instructions are important also to the life and economic functioning of the owner's investment. Pointers given in this discussion may be repetitious, but experience of owners, operators and manufacturers indicates some overlooking or disregard for such valuable information.

Cooling towers and evaporative condensers are purposely engineered to:

1 — Conserve water,

2 — Comply with restrictions on water supply,

3 — Comply with restrictions on sewage systems,

4 — Lower cost of operation whenever refrigeration or air conditioning is used.

An example is given below, citing savings obtainable with a cooling tower installation:

Assume that an office building independent air conditioning unit, because of its distance from the main plant which has a refrigeration operation, has been wasting condenser water to the sewer. The cost per season of this wasteful practice may be figured as follows:

Cons. × Tons × Taxes × Time = Cost

Where, Cons. is consumption in cu. ft. water used per hour for condensing per ton of refrigeration effect (1.5 gpm/ton and 7.5 gals/cu. ft.),

Tons is the capacity at which the system is operated (estimated @ 40 tons),

Taxes is the sum of water and sewage rates in dollars per cu. ft. (assumed in this case to be 20 cents and 10 cents per 100 cu. ft. for water and sewage taxes, respectively), and

Time is the total hours of operation per season (figured here to 1200 hours).

Then,

12 cu. ft. × 40 tons × $0.003 × 1200 hrs,

(a) or $1728.00 cost

Place a cooling tower in this system, and by means of the same formula, estimate water costs due to makeup which is assumed at five percent maximum (average is three percent or less):

0.6 cu. ft. × 40 tons × 0.003 × 1200 hrs,

(b) or $86.40 cost

However, to this water cost must be added cost of power for pump and blower motors. Table 1 gives average motor kw consumption for these tower accessories. Cost of operation for these is figured as follows:

$ × kw × Time = Cost

Where, $ is rate per kilo-watt hours,

Kw is sum of motor demands per hour (from Table 1), and

Time is the 1200 hours estimated previously then,

$0.02/kwh × 6 kw × 1200 hrs,

(c) or $144.00 cost

Waste cost **(a)**, less the sum of makeup cost **(b)** and added power cost **(c)**, would indicate a substantial savings:

(a) $1728.00 − ($86.40 **(b)** + **(c)** $144.00), or $1498.60 Savings.

TABLE 1 — AVERAGE KW DEMAND OF COOLING TOWER PUMP AND BLOWER ACCESSORIES.

TR	Kw
15	1¾
20	3
25	4
30	6
35	6
40	6
45	8
55	8
70	12½

Selection of The Unit

Often practical engineers are called upon by their employers, to make the

Condensed and revised report of a talk given by J. T. Maloney, Applications Engineer, Acme Industries, Inc., Jackson, before Michigan Chapter No. 1 NAPRE, Detroit, May 1955.

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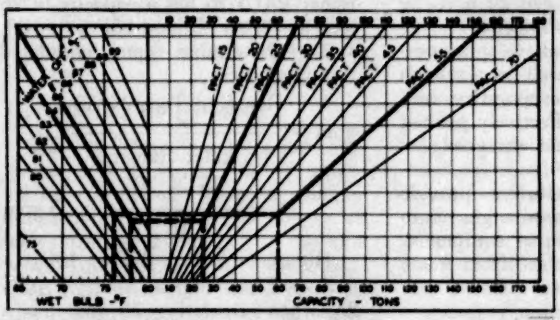

Fig. 1—Selection Chart for Cooling Towers, Given the System Capacity and Desired Operating Temperatures. Capacities shown are low side tons. Each ton is equivalent to 15,000 Btu/hr heat rejection.

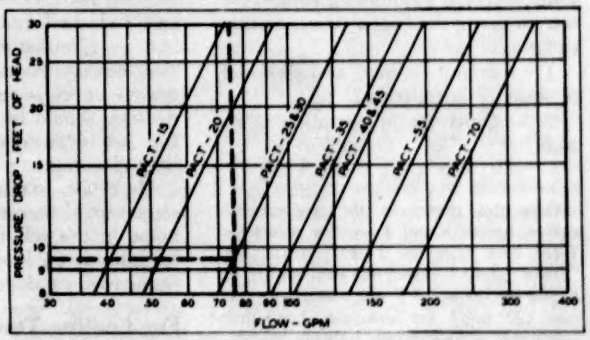

Fig. 2—Internal Pressure Drop for Cooling Towers shown in Fig. 1. Water Flow Rate Through Tower Must Exceed Minimum Flow Rate Shown for Given Models.

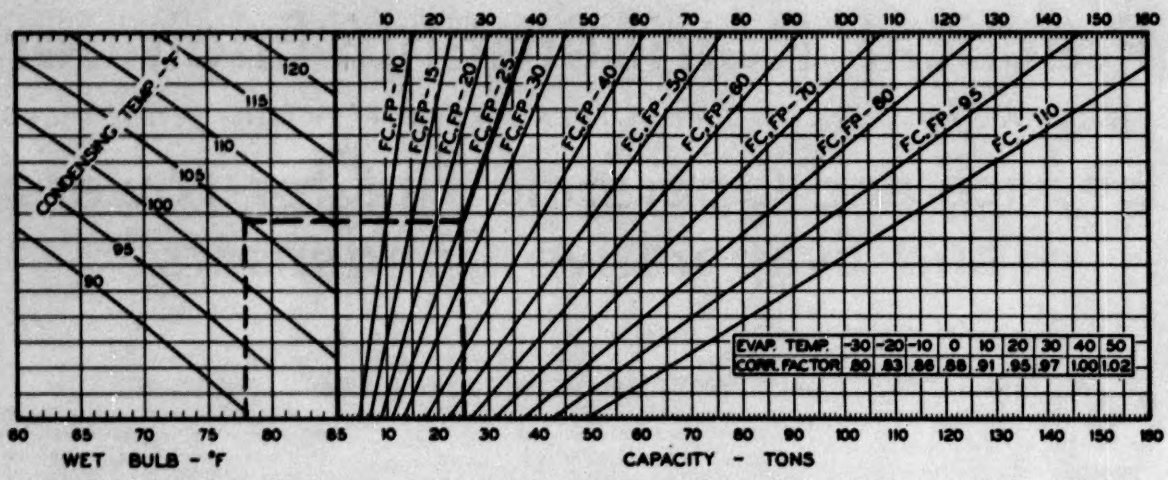

Fig. 3—Evaporative Condenser Selection Chart for Fluorinated Hydrocarbon Refrigerants (Copper Coils).

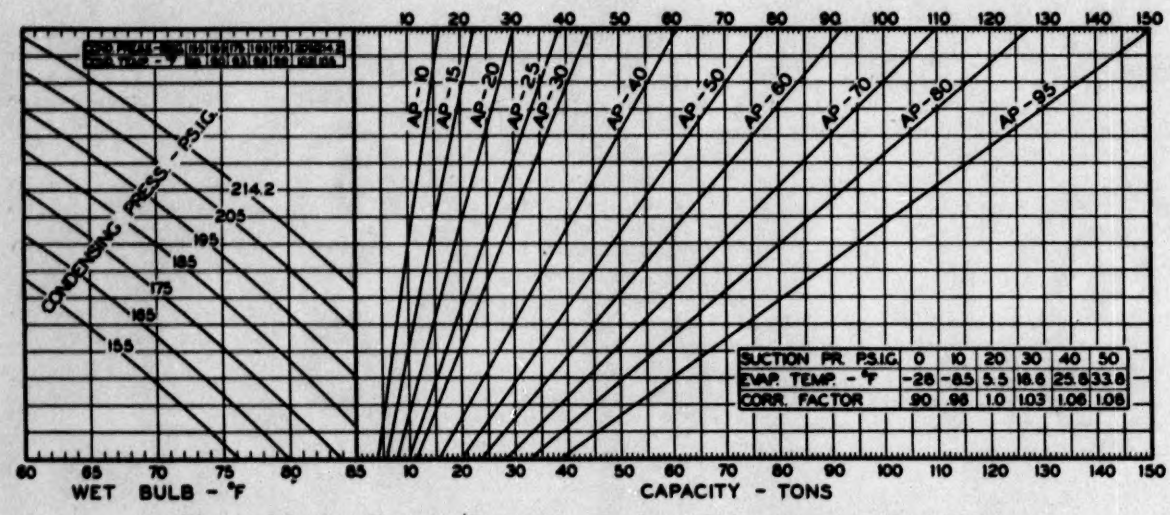

Fig. 4—Selection Chart for Evaporative Condenser Using Ammonia (Steel Coils)

selection of either a cooling tower or condensing medium. Business economics cause the owner to rely on the chief, rather than employ consultation on a small system, or for a component addition or replacement to an existing system. Following are some practical pointers on equipment selection, in the water conservation category:

1 — Is unit compact and sectional to simplify installation?

2 — Quietness in operation is an asset.

3 — Rugged construction is important. Is it all metal and fireproof?

4 — Corrosion resistance may mean dollars saved. Hot dipped galvanized is still the most popular and least expensive.

5 — Are all major components accessible for service; can all parts be easily cleaned and serviced?

6 — Eliminators above spray nozzles, especially, as well as stack on towers or coils in evaporative condensers, should be effectively pitched for fast drawing and designed for easy cleaning.

Most all manufacturers provide some sort of literature to engineers to assist in the selection of equipment. Samples given below are from Acme Industries' catalogues:

For Cooling Towers

Example No. 1 — Select a cooling tower to meet the following specifications:

Refrigeration Capacity .. 25 tons
Temp. of Water to Tower 95F
Temp. of Water off Tower ... 85F
Wet Bulb Temperature 78F

1 — From Fig. 1, select a tower with capacity equal to or greater than required capacity at operating conditions: PACT-25 has a capacity of 25 tons at 78F W. B. and 85F water off.

2 — Determine gpm circulated through tower:

$$\text{gpm} = \frac{\text{Required Tons} \times 30}{\text{Water Range}}$$

$$= \frac{25 \times 30}{10} = 75 \text{ gpm}$$

(Range = 95F − 85F = 10F)

3 — From Fig. 2, Model PACT-25, when circulating 75 gpm has a pressure drop through the tower of 9.5 ft. head. Add this to external head to determine pump required.

Example No. 2 — Select a cool-

Capacities shown in the performance curves, figures 3 and 4 are low side tons. Total heat rejection 14,000 Btu/hr for "Freon" at 40 F evaporator temperature, or 15,000 Btu/hr at 5.5 F evaporator temperature (20 psig) for ammonia. For other evaporator temperatures, multiply the capacity of the unit at the required conditions by the correct factor from the correction factor tables in Figs. 3 and 4.

ing tower to meet the following specifications:

Water Flow Rate ..... 160 gpm
Temp. of Water to Tower .. 95F
Temp. of Water off Tower .. 84F
Wet Bulb Temperature 76F

1 — Select a cooling tower to cool 160 gpm water from 95F to 84F at 76F W.B.

$$\text{Tons Required} = \frac{\text{gpm} \times \text{Range}}{30}$$

$$= \frac{160 \times 11\text{F}}{30}$$

$$= 58.7 \text{ tons}$$

2 — From Fig. 1, select a tower having a capacity of 58.7 tons or greater for 84F water off, Temperature and 76F wet bulb:

Selection — PACT-55 has a capacity of 60 tons at 84F water off, and 76F W.B.

3 — Determine pressure drop through tower and external system, and select pump as in Example No. 1.

For Evaporative Condensers

Example No. 3 — Select an evaporative condenser to meet the following specifications:

Refrigeration Capacity (Low Side) ..... 25 Tons
Refrigerant ..... "Freon-12"
Suction Temperature 50F
Condensing Temperature ...105F
Wet Bulb Temperature 78F
Condensing Coils ..... Copper

1 — The capacity correction factor for 50F suction temp. for "Freon" is 1.02 from the correction table in Fig. 3.

2 — Minimum Capacity Required

$$= \frac{\text{Actual Tons}}{\text{Corr. Factor}}$$

$$= \frac{25}{1.02} = 24.5 \text{ Tons}$$

3 — Select a unit from Fig. 1 having a capacity equal to or greater than the minimum required capacity from (2). At 78F W.B., 105F C.T. an F.C.—25 (copper coil unit for Freon use) will have a capacity of 25 tons.

Operation Comparisons

Hot refrigerant gas from the compressors is condensed in a water-cooled condenser when a cooling tower is used, or thru a copper or galvanized steel pipe coil in the unit when using an evaporative condenser. The heat dissipation takes place in the counterflow motion of the water with the induced air thru the unit.

In a water cooled condenser, using city water, the heat absorbed is approximately 10 to 20 btu. per lb. of water circulated. In the city of Detroit approximately 1½ to 3 gpm of water is required per ton of refrigeration. Assuming that in the city of Detroit (or environs), the average entering water temperature during the summer period will be 75 F, the leaving water would then be 95 F or require 1½ gpm of water per ton of refrigeration (90 gallons per hour). When water temperature rises, consumption increases accordingly.

In a cooling tower or evaporative condenser, each pound of water evaporated, would absorb approximately 1050 Btu. Assuming that the heat of rejection to be 14,400 btu. per hour per ton, 13.7 pounds of water would be evaporated. To avoid deposits of salts, algae and other residue materials, it is recommended that an equal amount of water be wasted. Therefore, each ton of refrigeration would only require 27.4 pounds of water per hour, or less than 3½ gallons. The savings would be in excess of 96 percent. In cities where higher water temperatures prevail and 3 to 4 gpm of water is required per ton, the savings will be 97 to 98 percent.

Assuming a normal summer operation (1500 hours) where 1½ gpm of water is used per ton of refrigeration, a savings of approximately 129,600 gallon per ton is possible per season. With the present shortage of water, this savings is quite important.

Another item not to be overlooked, is the additional savings in the cost of installing a sewage system to carry off large volumes of water. Often times, present sewage facilities are inadequate.

Installation Pointers

When a unit is installed, either indoor or outdoor, the space provided should be so situated that the discharge air will not be recirculated. Also, determine that the discharged air is not exhausted against an adjoining building where windows are to be opened. On units to be installed indoors, the supply air can be taken from the inside to aid in ventilating indoor spaces during the summer period.

The supporting base and cross members should be of such construction to amply hold the weight of the unit and operating water, plus the additional stress caused by high velocity air motion experienced during storms.

Outdoor units, used during winter periods, should have the water drained to a tank in a heated space. If the evaporative condenser is placed outdoors and a definite head pressure is to be maintained, the unit can be equipped with dampers to by-pass the air. On cooling towers, the fan can be controlled by a pressure cutout in the refrigerant circuit.

Start-Up Checks

When unit is ready to be placed in operation, the fan shaft should be checked so the operating position is perfectly level. The fan motor, belts and sheaves should be checked and lined up properly. The belts should be matched to overcome uneven stresses on the fan shaft. Bearings should be checked so the shaft is turning freely. The bearing should be greased before being placed in operation. Wheels should be turned by hand before starting the fan motor.

Check fan rotation, and correct when necessary. Pump motor and pump should be checked and pump rotation corrected, if necessary, before being placed in operation. Piping should be vented and air purged before pump is placed in continuous operation. Check water level and float valves.

Sediment screens on inlet water to pump must be cleaned periodically. Sump must be cleaned periodically, lubrication checks made regularly.

Water Treatment

Most cooling towers and evaporative condensers are equipped with automatic waste, which is a bleed-off to overflow stand pipe. This should be checked to see that the unit actually wastes sufficient water. All towers and evaporative condensers should be thoroughly cleaned every month of operation, to prevent deposits and algae formation.

If bad water is encountered, it is suggested that the water be tested with pH testing paper. The water to be neutral, should be between 6.5 to 7.5; below 6.5, the acid content will be corrosive; above 7.5, the alkaline contents will allow fouling. If tests indicate water to be below 6.5 or above 7.5, corrective measures by a local water treatment consultant are recommended.

If the cooling tower or evaporative condenser is not to be used during the winter months, the entire unit should be cleaned and lubricated. When system is again placed into operation in the spring, the entire unit should again be checked and lubricated. Fan wheels should be turned by hand, until they rotate freely. The pump should be cleaned of dirt and rust before operating. Each spring the fan and pump rotation should be checked as wiring connections might be alternated at main disconnect.

From the President's Desk

SEPTEMBER already! The kids are about to go back to school. Summer vacation is over. All chapter meetings resume this month. Presidential advice to the membership for the rounding out of a successful year: Now is the time to live up to that good resolution to attend the next NAPRE meeting. Show the old faithfuls that you are still with them, and that you will do all you care to finish the year in a blaze of glory.

ALONG the line of advice, here are some suggestions for the local committee chairmen: Now is the time to recheck your plan for the year. If it is working fine, continue to keep it that way. If the plan is not working, find the trouble and correct it. If your committee is among the few who did not have a plan, it is not too late to develop one and work it. It is better to have one a little late than not have one at all.

Local Committee Instruction

A few planning suggestions which a good committee would consider for the Fall are as follows:

The chapter educational committee: The chairman or a member of this committee should see that the preliminary class instructor is ready to restart his class, and that he has the necessary material to do a good job of conducting the class. Learn whether the chapter secretary has supplied the instructor with the Introduction, Foreword and first two chapters of Guy R. King's Instructor's Manual for use with *Basic Refrigeration*, our official text. See to it that all interested members and prospects are informed of the class, and its meeting time. Also, attend the class yourselves and help in the discussions.

The chapter program committee: Chairman and members of this committee should see to it that all the remaining meetings of the year are provided with speakers, inspection trips or educational film, as per your plan. Again, if your group did not have a plan it is not too late. Get busy right now and line up all the necessary speakers, etc. You will find it easier to do now than just before each meeting. The speakers have less opportunity to say they are busy. If your meetings are all lined up and publicized in advance you will find that the attendance is always tops. Members will plan their evenings better.

Chapter membership committees: Those of you who are on your local committee of this classification should really get busy. The membership drives to date have not been all we expected. The drive for members in the cold storage industry has not developed all the members it is capable of. Other leads have been overlooked.

To put it bluntly, most of the local membership committees have let the National membership committee down. There is no evidence of any hard work on the plan outlined by our National Chairman, Bill Orton. Very few chapters have followed up on the lists of prospects sent out from headquarters, or if they did follow up on them they failed to report their results. These results, good or bad, are necessary so that the committee can find out what is wrong with our drives and how to correct them in the future. All local membership committeemen are urged to report their results as soon as possible.

Stirs Convention Attendance

Remember, brother members, if you have not used up all your vacation time, save it for the convention here in Los Angeles, November 8-9-10. If you have used up your vacation, start talking it up with the boss how much value it will be to the company and yourself to attend this educational meeting. Here, the better of operating refrigerating engineers get together and discuss subjects that are of interest to management and engineers. Elsewhere in this issue is another preview of convention activities being arranged.

Incidentally, when our public relations committeeman, Larry Benedict, made his motion picture of his trip to New Orleans and return for the 45th annual convention, he went by way of Chicago and returned by way of Texas. He said the round trip from New Orleans to Los Angeles via Chicago cost about one dollar more than a round trip from New Orleans to Los Angeles via Texas. He further stated that by leaving on a Wednesday he was able to take his wife along on the Family Plan offered by the railroads for only half fare.

Some registrations are already received, and some exhibits contracted for by NAPRE backers. Apparently some members want to assure themselves of accommodations, which the California No. 2 Chapter will have reasonably and many of. These exhibitors, however, know that space is limited and they are wise to reserve choice space now.

New Orleans Report Cited

Last month your president apparently established a precedent without knowing it. In the August issue, a chapter report from the Seattle secretary was cited as being particularly outstanding. Our vice-president, responsible for the chapter member's welfare, Leroy Etzel, and our National Secretary, urged that I continue to cite the chapter each month with an outstanding report.

This month our gentleman of distinction is Max Sofer, who writes the reports for Louisiana Chapter No. 2, New Orleans. Max related information that should be of value to all of us. Further, he obtained a copy of the speaker's paper in connection with a recent talk made before his chapter on a 277-volt lighting circuit. This is a new one on most of us in the refrigeration field. The paper not only covers 277-volt lighting but industrial motor power service in the 400 voltages as well, with particular emphasis on refrigeration and air conditioning. The editor has indicated that the paper will be published in INDUSTRIAL REFRIGERATION early this Fall, possibly as a feature item.

Convention Film Schedule

Our moving picture account of the New Orleans convention has just about completed its nationwide tour. The following chapters have yet to receive the film:

	Sept.		Oct.
Indianapolis	1	Stockton-Modesto	4
Twin Cities, Minn.	7	San Jose	10
Chicago	13	San Francisco	12
Kansas City	16	Sacramento	18
Dade County, Fla.	20	Fresno	31
Denver, Colo.	27	Colton (Nov.)	2

Having mentioned the film circulation it is my pleasure or opportunity to personally thank Larry Benedict, member of our National Public Relations Committee for the loan of this film. Larry expended a great deal of time and money in making the film, editing it and in circulating it to all the chapters in the United States. The Association's thanks goes also to the chapters for their careful and considerate handling of the film. Thus far, there have been no accidents reported with the film and only one schedule was missed.

Regis Enbeer

NAPRE

Question Box

The National Educational Committee, NAPRE, answers monthly in this column, operating problems forwarded by members. The Committee appreciates answers from the field. Address questions and answers to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif.

FOLLOWING a precedent established by the late Prof. H. G. Venemann, this column for September publishes additional replies received on recent questions. It is the policy of NAPRE and the publishers of INDUSTRIAL REFRIGERATION to encourage more answers from the field. We are happy to have this opportunity of printing more replies, and thank the contributors for their interest.

Answers to Questions 1069 through 1073, published in the August issue will appear in the October issue; plus a reply to "More on 1064" in this issue, and several interesting new questions received as we go to press. Harold P. Hayes, Chairman Educational Committee

More on Question 1049

Large Temperature Rise With Freeze Tunnel Water Defrost

QUESTION NO. 1049: Would it be too much trouble to ask you for some information on defrosting units. We use water defrost, and during the running season we have to defrost once or twice a day. Each time we defrost, it brings the temperature up 30 to 40 degrees warmer in the tunnel and we lose too much time in pulling the tunnel down again to 30 to 40 degrees below zero. Could you recommend some other way of defrosting? —W.G., Canada.

ANSWER: No. 2: I was particularly interested in this question having to do with temperature rise during water defrost cycle (INDUSTRIAL REFRIGERATION, May 1955, page 59).

Actually, the water defrost system, properly installed and regulated, results in a lesser temperature rise than is the case with any other system. The reasons for this are very easily understood. In any defrost system, it is necessary to introduce heat sufficiently to (1) overcome the leakage to the air (2) melt the frost (3) raise the temperature of the coil itself to something higher than 32F. If the introduction of heat can be applied in this sequence, the resulting rise in coil temperature is obviously minimized.

In other words, with the introduction of, say, 60F water to the accumulated frost, the frost is melted at the same time that the leakage to the air is being satisfied;

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and when the frost has been completely melted, the coil is raised to a temperature of only slightly above 32F. With any method of defrost where the heat is introduced from the inside of the system, it is necessary to first raise the temperature of the coil surfaces to considerably above 32F. before any work is done on the frost itself. As the frost or ice falls away from the coil surfaces and into the drain pan, it is necessary to continue the application of heat until this frost or ice that is now in the drain pan is completely melted and drained away.

While heat is being applied to this frost and ice, a great part of the coil surface is bare and radiating heat at relatively high temperatures to the air, the product and the walls. This is all heat that must be withdrawn on the resumption of the refrigeration cycle. Where water is used, the interchange of heat between the defrost medium (water) to the frost is completely an interchanging; one within the other, and is drained away without giving up any considerable amount of heat to the refrigerated area.

I would like to point out that one (1) gpm of water, changing in temperature from 60F to 40F, has a thermal capacity of 10,000 Btu per hour; obviously, it would take approximately three (3) KW of electricity to provide the same quantity of heat for the work to be done.

It is my belief that the difficulty of W. G. lies in the fact that he is not supplying sufficient water and because of this lack of water quantity, finds it necessary to continue the defrosting operation over a longer period of time than what should be necessary. If proper water quantities are supplied, it is usually possible to defrost a rather heavily frosted coil in from 4 to 8 minutes.—H.A.H., Los Angeles, Calif.

More on Question 1061

Seeks Mobile Defrost System

In "Calcium Chloride in Refrigeration," by Solvay Technical and Engineering Service, Bulletin No. 4, Sixtieth Edition, Issued 1953, page 33, I see in paragraph 3 a periodic defrosting by a portable tank unit complete with electric heater. That system would be convenient for my purposes. Have you any information on the subject? Are those portable tanks manufactured? Any plant you know equipped with a portable tank?

I manage a cold storage plant with Calcium Chloride Brine System refrigerated by two ammonia compressors 7½ in. x 7½ in. and 5½ in. x 5½ in. I want to find the best method for defrosting the coils in the room.—G. B. Rimouski, P.Q.

ANSWER: I have used a mobile brine heating tank for heating calcium chloride brine to defrost brine coils in a five story cold storage warehouse for about fifteen years. It sure does a good job. So far as I know there is no one manufacturing a heater of this kind so you will have to build it yourself.

The sketch shows this heater mounted on a flat top cold storage four-wheeled truck. The size of the truck limits the size of the heater unit, which consists of an insulated steel shell containing iron pipe coils with a motor driven centrifugal brine pump. The rubber hose brine connections are flexible for easy connection to any coil.

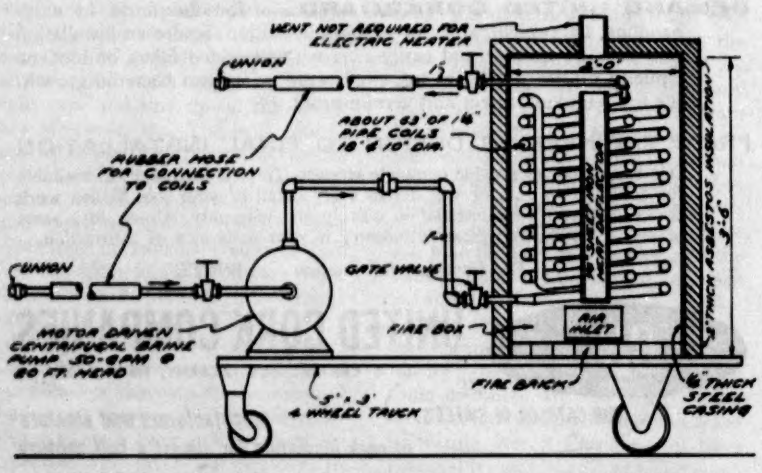
The tank size shown fitted in with our requirements. The way we used it was to move it from hall to hall on the ground floor where we connected to hot brine risers to the various floors and then to the different rooms. By doing this we were able to use a gas burner in the heater. The mains up or through the building should be covered to keep the condensation off them. If they are not insulated the condensate will drip on anything under the mains.

If you have drip pans under the coils you can let the frost and water drip into them and go down the drain in a room above freezing. This is so if the frost on the coils is not too thick and hard. If the frost is thick and hard allow it to thaw loose from the pipe slightly then bump it lightly with a piece of 4 x 4 lumber. The ice will break loose and fall into the drip pan or on to the floor and then can be taken out of the room.

In a freezer room only allow the frost to thaw loose from the coils and then bump it off. This will keep to a minimum the water that will get on the floor and freeze there.

The inside of the heater coils will get covered with scale due to heating the brine and will need cleaning now and then. You can tell when this is necessary by the length of time it takes to heat the brine. Use a 50-50 solution of water and hydrochloric acid and circulate it through the coils with the brine pump until they are clean. It may be necessary to repack the brine pump when you clean the coils.

The room coils you are defrosting must be shut off from the main brine circulating system and be connected to the heater system only. When you start up the brine pump on the heater it will be necessary for you to prime the pump and fill the defrosting mains from the main cold brine system so it will work properly. The temperature to which you heat your defrosting system brine will determine the time it takes to loosen the frost.—C.W.H., Fort Worth, Tex.



Mobile heater for defrosting brine coils. May be gas or electrically heated

More on Question 1062

Queries Detrimental Effect Commercial NH_3 Impurities

QUESTION NO. 1062: Concerning R.T.'s answer to Question No. 1047 in the April issue "Industrial Refrigeration", R.E. explains that commercial grade liquid ammonia is 99.50 percent pure while refrigeration grade lacks .002 percent of being pure. I am wondering just what these impurities in the commercial grade would consist of. Would they be of an explosive or perhaps corrosive nature, or would it be in the form of moisture?

We are of the opinion that such a small amount of impurities would be of no consequence at all especially where close attention is given to purging.

It so happens that we have almost an endless supply of the commercial grade of ammonia at our back door, and at a price of less than half what we are paying for the refrigeration grade. We are quite anxious to take advantage of this cost situation, as well as the convenience of delivery if such a thing is possible. I shall greatly appreciate any information that it is possible to get concerning the above.—B. E. S., Fairmont, Minn.

ANSWER: Premium quality is habitually the cheapest in the long run. It has been noted that plants using the lower grade ammonia are definitely on the down grade. I could name three or four here in Texas as examples.

My observation is that ammonia that is not advertised as certified or guaranteed Refrigeration grade has from time to time various impurities; moisture, incondensable gases, and oil being the residue. *The manufacturer guarantees the nitrogen content of commercial grade at a minimum percentage and may vary the inerts a great deal.*

The conclusion is that while the Commercial grade liquid ammonia may be usable in refrigeration operations it varies to a great extent in the amount of impurities. The extra load imposed on power, and ammonia loss through excessive purging and draining off moisture, is unprofitable. Automatic valves stick after some use and after extensive use maintenance requirements rise sharply.—T.K.F., El Campo, Texas.

More on Question No. 1064

Asks Inhibitor Suggestions

QUESTION NO. 1064: In January '55, page 41, Question No. 1032, in the final paragraph of an answer on "Bulging Ice Cans" you will see the reference "use an inhibitor to prevent corrosion." We in Australia have tackled this problem of corrosion from many directions, starting with pH control and the employment of various subsequent treatments. But have you a firm recommendation as to the best inhibitor which can be used?—N. K. General Secretary, Ice Mfr's. Assn., New South Wales.

ANSWER: In January 1955, page 41, Question No. 1032, in the final paragraph of an answer on "Bulging Ice Cans" you will see the reference "use an inhibitor to prevent corrosion." We in Australia have tackled this problem of corrosion from many directions, starting with pH control and the employment of various subsequent treatments. But have you a firm recommendation as to the best inhibitor which can be used?—N.K. General Secretary, Ice Manufacturers" Assn., New South Wales.

In Answer No. 1, H.P.H. quoted Ca Cl Inst. as recommending 125 lbs. sodium dichromate to each 1000 cu. ft. of calcium chloride brine for a corrosion inhibitor. K.M.H. in Answer No. 2 quotes from the 1954, NAPRE Operating Data Book, from his own article, and recommends ". . . 15 lbs. sodium dichromate . . . per 1000 cu. ft. . . ." Its been a long time since I've seen the professional sales organization and the practical engineer so far apart — or did the publication allow a typographical error? D.K., Oak Park, Ill.

News Notes and Chapter Activities

Los Angeles

FRED HERR

We have been remiss in not reporting that NAPRE's national president and our Chapter member, Regis Gubser, was an active participant on a panel in the April "Electrical Maintenance Conference" held at USC by EMEA. Panel topic was "Special Instruments, Tools and Methods Used in Maintenance". Gubser covered use of: an amphere—hour meter to check storage battery capacities; low-voltage transformers to check magnetic switch heater coils; and, a simple "make-it-yourself" ground detector system for 440-volt electrical systems.

Los Angeles Chapter sponsored a golf tournament at the Montebello Country Club in Montebello, Calif., Sunday, May 29, as a "warm up" to the National Convention tournament in November. The winners of the handicap affair were: Frank Muzzi, low gross, 81; Frank Eccleston, second low gross, 83; Herbert N. Royden, low net 75; and Elvin B. Beck, second low net 76. Rudi Kettler came through with birdies on the 160 yard second hole and on the 520 yard No. 4. Eccleston also birdied the fourth hole. Lunch and refreshments were served at the "19th Hole"—the Eccleston home in Montebello.

Dr. Louis Cutler Wheeler, associate professor of botany, University of Southern California, presented a talk on "The Botanical Aspects of the Narcotic Laws" at the May 18 meeting. The educational program for that night offered one of the science talks with which the chapter varies its refrigeration programs from time to time. Dr. Wheeler's talk kept his listeners on the edges of their chairs as he discussed the various elements of narcotics, and the laws that have been formulated to prevent harmful use of the drugs.

Herman P. Ferber was initiated into membership. A discussion was held as to whether the chapter's traditional Old Timers' Night on June 15 should be varied this year by combining it with a Ladies Night Program. This was suggested by some members who felt that an opportunity should be provided the ladies of the chapter to become better acquainted with one another because many of them will be serving together on the ladies committee for the national convention. A show of hands revealed a preference for retaining Old Timers Night in its original form, and arranging some other event during the summer, possibly a basket picnic, to bring the ladies together.

Los Angeles Branch, NAPRE, closed out its pre-summer activity on a note of fun and frivolity on June 15, by combining Old Timers' Night with a program of entertainment. The program prepared by Ed L. Nelson's entertainment committee was offered in four parts: a social hour from 6 to 7 pm.; dinner from 7 to 8; a brief business session followed by introduction of "Old Time" members; and a sports film, followed by a floor show.

Preceding the dinner, members and guests gathered in the social hall of the Terminal Club for a community sing, with Miss Irma Vail, Hollywood pianist, supplying the accompaniment. This session proved definitely that chapter president Elmer A. Johnson, and second vice-president Victor A. Stubblefield are vocalists of considerable merit. Their renditions of "Spring Time in the Rockies" and "My Mexicali Rose" were notable for volume as well as harmony. Some enthusiastic listeners suggested that Ed L. Nelson, also convention entertainment chairman, spot them on that program, and Ed gravely promised to give the matter careful consideration.

Following a pot roast dinner, President Johnson held committee reports to a minimum. James A. Bumpus, York Corp., and Ned Bradley, Royden Ice Co., were initiated into membership. Frank Muzzy, membership chairman, voiced a plea for uninterrupted work on the campaign during the summer months when no meetings are held. Fifty-five more members by mid-September is the goal, the "more" meaning, Frank emphasized, that many additional to those already signed up for 1954-55. The ham-and-beans dinner on September 14, which annually launches the chapter's fall meeting program, Muzzy announced, will be combined with "Go Getters" night, with every member who brings in a new member being awarded a prize. Prizes will include bacons, hams, cases of tuna, imported cheeses and other choice edibles.

Nelson served as master-of-ceremonies at the introduction of Old Timers. An "old timer", according to Nelson's definition, is a member with 15 or more years affiliation with NAPRE. The first man introduced was the chapter's only surviving charter member, popular Wesley J. Lamphier, retired, who has held uninterrupted membership in Los Angeles chapter since its founding in 1922. Introduced next was William Losch, who joined Dallas, Tex., chapter in 1921 and later demitted to Los Angeles. Five were present from the class of 1925—John N. Berger, Herbert N. Royden, Emmet T. Quinn, Frank Elliott and W. A. Burnett. Next in order of seniority were Frank Hooper (1926), Nelson (1928). Others presented were Phillip E. English, Cliff Nordholm, Rudi F. Kettler, Frank Eccleston, Thomas Sherwin, Ralph M. Moore, George F. O'Connor and Elmer A. Johnson.

Twelve past-presidents attended: Royden (1928-29), Nelson (1932), Quinn (1933), Elliott (1936), Kettler (1949) Edgar M. Marrs (1952), Muzzy (1953), Burnett (1940), Sherwin (1944), Moore (1947), Don Byl (1948) and Eccleston (1954).

The chapter's deep-sea fishing enthusiasts got their summer schedule underway on June 17 when Rudi Kettler, Herbert N. Royden and Jim DeLore took off on the chartered boat "Albacore" for some sport fishing off Ensenada, Mex.

Kettler also scheduled three other summer fishing trips for June 23, July 21, and August 11. The fishing boat Sabre, a deluxe air conditioned craft, was chartered for those dates and accommodated 17 members. All three trips were in waters around San Clemente Island off the coast of Southern California.

F.T. "Mike" O'Hara reported on his return from the NAPRE convention in New York in June, that he had had a few moments stop-over in Chicago and had an opportunity to telephone the National NAPRE Offices. He reports that many Chicago members are enthusiastically awaiting our convention here in Los Angeles.

New Orleans

MAX SOFER

AFTER a chapter had the privilege of having a national convention held in its city, the members have a tendency of slacking off a little in their chapter work. This "Resting on Laurels" is a natural tendency after a hard job is accomplished. However, Louisiana Chapter No. 2 weathered this let-down and is moving ahead with their work.

Thanks to the coordinated efforts of our officers and committees, New Orleans has enjoyed some wonderful meetings. The ever increasing attendance at our educational sessions proves again that a well conducted course is of primary interest to the membership. Without inducement of entertainment or promise of free food and drink, our lectures have been very popular. Our drawing card is our new professor, Thomas Stokes, who has filled the Roosevelt Hotel University Room with eager listeners during the month of May.

A demonstration at one of our lectures was outstanding. It seems that quite a few refrigeration engineers are under the impression that two gases of different specific weights when placed in one container have a line of cleavage; the heavier of the gases in a condenser would fall to the bottom, the lighter one rise to the top. That assumption was proven to be false by a simple test.

A glass cylinder which was filled with air had red litmus paper strips suspended from top to bottom on the inside. Ammonia which is lighter than air was then added to the top section of the cylinder and after a few minutes the litmus paper throughout the cylinder turned blue. (The ammonia was added to a piece of cotton and then inserted into the cylinder so that no turbulence would occur). This experiment proved conclusively that the ammonia gas mixed with the air and did not stay on top.

At our first meeting in May, Educational Chairman Marion Olivier introduced Herman L. Waltzer, General Representative, International Salt Co., who presented a film on salt. The picture showed the different processes used in producing salt and its many uses in home and industry.

Bro. Leo Vivien explained the function of the "Venemann Memorial Educational Fund" at our second meeting. This trust, set up at our last national convention (New Orleans) needs support from all the chapters of NAPRE in order to become a reality and benefit some deserving young men to further their education. After a short discussion, a motion by Frank Chase to contribute a sum of money from the local chapter to the trust fund was carried unanimously.

On Wednesday, July 27, our Chapter was the guest of the Kaiser Aluminum Co., Chalmette Plant. One hundred and fifteen members and guests took advantage of the opportunity to see the biggest aluminum reduction plant in the U.S.A.

Ore from which aluminum is derived is called bauxite, which is shipped from Jamaica to the Kaiser Plant in Baton Rouge. There it is reduced to Alumina, aluminum oxide, a white powder, which is shipped by rail to the Chalmette Plant. A 2,000 foot long rubber composition belt transports the raw material to the eight potlines each containing 144 cells. By adding cryolite which dissolves the alumina, the resulting mass becomes a conductor of electricity. A 70,000 amp. current at 6 volts applied through carbon electrodes then raises the temperature in the pot to 960 degree C., frees the oxygen and other impurities and leaves the pure (99.9% plus) aluminum to be poured into molds. Each pot produces 1,000 lbs. of metal per day, which makes the yearly production come to about 400,000,000 lbs . . . a big operation.

In order to accomplish this feat 475,000 KW are needed. At this point our members were introduced to the equipment required to generate this huge quantity of electricity. A battery of 15 Foster-Wheeler Boilers and 80 Nordberg Gas Engines are necessary. All of this equipment is gas-fired. Aluminum reduction is big business. The company which supplies natural gas from the fields to the plant is paid $500,000 a month for their service. The boilers generate 225,000 lbs. per hour at 900 psi and 915 F; "Bailey" control equipment is used. All steam supply lines manifold into a common header which furnishes power to the G.E. turbine-generator sets. These generators produce A.C. at 13.8 KV which is transformed and rectified since all potlines require D.C. The gas engine driven generators produce D.C. and can be connected directly to the pots; however, maintenance required for these engines compared with steam driven equipment, offsets this advantage.

At the cost of $6,000,000, Kaiser Aluminum is now building a stack which will be 550 feet high for the purpose of carrying the waste gases off at a higher level. This will eliminate the scrubber towers now in use and prevent even small quantities of harmful gases from effecting plant life in the neighbouring area.

Glenn Weakley, plant public relations manager, who made this plant visit possible, was kind enough to ask some of their technical personnel to explain the various phases of operation to our group. Special recognition was given to Frank Wilson, supervisor, A. C. Generation; Francis Kirwin, operating superintendent, Power Division; Claude Ford, supervisor, Power distribution; Jack Saucer, John Rorse, Dick Davis.

San Francisco

HENRY GUILMETTE

TO ITS annual financial program, San Francisco has added a new twist this year. Along with the normal expenses of the following year it is the hope of this chapter that we shall have enough money to finance a National Convention in San Francisco. Such a convention would be a tremendous honor to San Francisco and its California Chapter No. 1. The educational value of such a convention would be beyond estimate to all men of our industry in the Western states as well as California. Our members are being urged to do their share in bringing this convention to San Francisco.

Memphis

CHAS. CONLEY

OUR first June meeting featured a sound and color motion picture made for the Consolidated Engineering Corp., titled "Dynamic Measurements". This picture showed how all types of testing meters were made and how they were applied to record all kinds of stresses and strains such as rough handling of trucks and railroad cars, testing of autos, airplanes and such. By this information, design engineers can correct weaknesses and faults in designs; better claims can be filed with the railroads, shipping and trucking firms for damage done to products in shipment.

The 1954 convention colored motion picture taken by and produced by Larry Benedict was shown. This picture was quite interesting for it showed Mr. Benedict on his way to the convention from his home through the various cities. The picture would have been perfect if he had only taken a few shots of Memphis. Our group thought enough of the picture that they had it shown a second time.

The Tri-State Armature and Electrical Works on Friday June 3, had "open house" for our chapter in celebrating 35 years in business. They had built a new plant about a year ago. Friends of the company were invited to attend the celebration and were shown through the plant by officers of the company. Food and refreshments were served. Harry Lanahan, chairman of the board and general manager, and Henry T. Winkelman, president of the company, were on hand to greet the members as they came in.

Through member Clyde Stacks, chief engineer, The Humko Company, a tour of their new engine room, processing and packaging plant was made by 75 members and friends on Wednesday, July 6. This is an addition to the existing plant. In the new engine room, they have installed four York VW boosters and four York VW compressors. All compressors are fully automatic. The processing plant and packaging plant are fully air conditioned, using chilled water through Marlo blower type units. They have four storage rooms (where the product is held for delivery) that are kept cool with "Freon" condensing units using Marlo blowers to cool the rooms.

An elevator that will lift a 150,000 loaded railroad car from the ground level to the second floor is one of the unique installations in this plant. It is one of the largest in the U.S.A., and the plant is largest in the south that processes vegetable oils, into salad oils, cooking oils, lard and oleo butters.

The plant is equipped with very modern machinery and piping for the handling of raw product from railroad tank cars into the plant. After being processed, finished product is packaged and handled by modern machines which are almost human. All their processing vessels and pipe lines that the product goes through are stainless steel, walls and floors are of tile and a complete color scheme is used for the identification of the various pipe lines. It was a miserable night but the boys did turn out to see this plant.

Members-at-Large

BERT C. MCKENNA

NEW members accepted by NAPRE's Board of Directors during the Summer months are Alan George Pirie Knox Supervising Engineer, F. J. Walker, Ltd., Sidney Australia; Henry Levine, President & Engineer, and Howard S. Bennett, Design Engineer, both with Aireco, Inc., Schenectady; Michael A. Pagurko, Engineer, Hotel Beaconsfield, Brookline, Mass.; Dorr Dean, Manager, Secretary-treasurer, Silver Mill Frozen Foods, Inc., Eau Claire, Mich.; Harry J. Wood, Chief Engineer, Fairmont Canning Co., Winnebago, Minn.; Mathias G. Gabler, Master brewer, John Hauenstein Co., New Ulm, Minn.; and Edward Butts, Columbia Ice & Cold Storage, Asst Ch. Engr. Wenatchee, Wash.

The northeastern section of these United States is certainly well represented in our members-at-large, although the association has not populated that area with too many chapters. Perhaps we can encourage some of the following men to look into the prospect of forming a chapter in their locality: New York State is represented at Geneva by William F. Riley employed by the Geneva Refrigerating Corporation. William C. Maher is with Webb and Knapp in charge of refrigeration installations construction. He makes his home in the Bronx. Mrs. J. H. H. Voss still maintains her associate membership in NAPRE and was recently responsible for her engineer, Karl Schartel, becoming an active member. We note recently that Michael Pinn has applied for membership in ASRE, thereby indicating his interest in broadening his refrigeration knowledge. Over in Jersey, as we understand the New Yorkers say, there were several members heard from recently. G. N. Omahundra, River Edge, Clifford Rand, East Orange and Claude Brewer, Long Branch. Claude has been a contributor to the Question Box in INDUSTRIAL REFRIGERATION from time to time. Other members-at-large should take advantage of this activity.

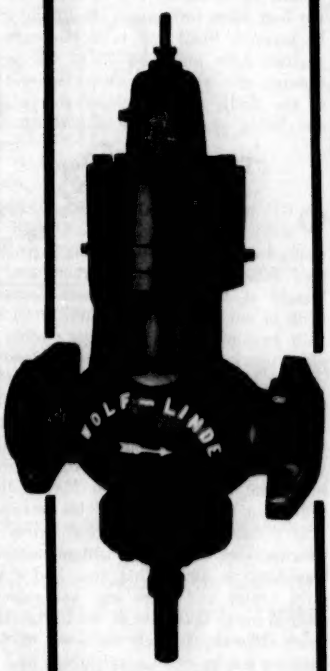
Down Philadelphia way we note that William Gretz, III, received some publicity from our national president in his column last month. And I take this opportunity to mention that Wm. Laverty of the Warwick hotel is also interested in getting that Philadelphia chapter formed. You fellows certainly shouldn't overlook Harry R. Katzen, Elkins Park, and it may be that he could take in a few meetings and recommend some other engineers outside of the Philadelphia Metropolitan area who would be interested. Over in York, Pa., the association is represented by Frank L. Kain and at Sandusky, Ohio, Robert L. Missig, an engineer for City Products Corp., who can be found among the loyal members in that city.

It has been the hope of the National Association to see some chapters established in the Baltimore-Washington, D.C. area. Judging from the president's page in June, some of our members-at-large in the Virginia area may obtain a charter ahead of the Maryland and Capitol groups. For the sake of promoting some intra-membership contacts, we list a few members in this area recently heard from: George Milnes, Baltimore, Vincent S. Peck, Mt. Rainier, Thomas Patterson, Salisbury, Maryland, and Charles W. Coblentz, Chief Engineer, Mutual Ice Company, Alexandria. Two members in Virginia who were probably very happy to hear of chapter formation prospects are A. C. Kniseley, with Niagara Blower Co., Richmond and E. E. Craig of Newport News.

Three members recently heard from in Georgia are Louis C. Roesel, Savannah, Conrad J. Romberg, City Ice Company, Gainesville, and R. B. Rich, general manager, U.S. Security Warehouse, Columbus. The Association had a chapter in Georgia many years ago and the Atlanta Chamber of Commerce has been after the Board of Directors for a convention in that area. There's one way to get it, fellows, and that is to re-establish your chapter.

It was good news to see that we had a live wire prospect for a chapter at Tampa, Fla. This will probably come as good news to Walter Galloway, Shippers Precooling Service, Lakeland; Wm. W. Johnson of Tampa and J. R. Comber of Pensacola. Completing our impromptu tour of the Atlantic Coast and Gulf States, other members-at-large heard from in the Alabama area were Wm. L. Rethman, of the Tutwiler hotel, and William T. Sanders, both of Birmingham and John F. Albach of Fairhope.

Wolf-Linde EVAPORATOR PRESSURE CONTROLS



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Tacoma

ELMER JOHNSON

AT THE Chapter's June meeting, Phil Gilmore and Glen Gray led the members in the study of evaporators in Guy King's Refrigeration Course. The members were very interested and there were a lot of questions asked which were answered to the satisfaction of the questioners. Tacoma Chapter has had several field trips during the last few months that were very interesting; trips were made through the Kaiser Aluminum plant, Hooker Electro Chemical Co., and St. Regis Paper Co.

At the May meeting, George Brackett, chief engineer of the Lewis Refrigeration Co. who represent the Frick Co., gave a very interesting talk on modern trends of refrigeration. He told how various parts of refrigeration systems have been improved during the past 10 or 15 years. As an application engineer, Brackett stated that it was his job to furnish a refrigeration system whose component parts would all balance to meet a specific load condition. After the installation it is up to the operating engineer to run the plant in such a manner that the highest efficiency would be maintained. He stated that bids should be checked very carefully so that the best plant for certain conditions would be secured. Shell and tube condenser capacities have improved 25 to 30 percent through the ability to insert more tubes in the shells through closer spacing. Recirculating systems were also discussed.

Texas Coastal Bend

VERNON KUMMEL

OUR meeting of June 3 was called to order by R. A. O'Neill. O'Neill had worked out details for building a partition wall between the meeting room and the lounge at the Corpus Christi Engineers Club to cut down on the noise interfering with meetings. After contacting other engineering societies, who were in favor of the wall, all were willing to contribute towards construction cost and our chapter donated $25.00. Our meeting was then turned over to our instructor, Dan Miller, who is back with us after taking a course in Public Speaking at Del Mar College. Following are highlights of his lecture:

The refrigeration industries' great expansion was due to an insignificant fact way back in 1890. That year had a very mild winter and there was not sufficient natural ice to take care of the refrigeration needs. Therefore, much study was made to produce ice by mechanical means and our great industry had its start because of necessity. The first delivery of ice was reported in 1892, while the first commercial shipment of ice to a foreign country was made in 1905 to Martinique. Development of automatic expansion valves and alternating current has made refrigeration possible to everyone who has electricity available.

The expansion valve was explained first by way of analogy to a boiler water control valve — it has the same relation to the boiler as the expansion valve has to the evaporator. The use of the expansion valve was discussed further. If the valve was closed too much, then the last part of the coil is inoperative in picking up a heat load. If it is opened too much, then you can flood your machine and damage it because all the refrigerant does not boil and some liquid is returned to the machine. A hand expansion valve was dismantled and "how and why" it works was discussed.

At the June 17 meeting Vic Sharke, United Supply, discussed thermal expansion valves and brought with him several types for examination by the members. Vic's talk was very good and all members present learned something useful about the automatic expansion valves as we know them today.

Yakima

ELMER TOOP

MORE Yakima members recently made local newspapers. The Yakima Herald has been running a series of articles on Yakima Valley industrial firms. One feature covered the Artificial Ice & Cold Storage Co., the firm which gave Toop his early start.

Quite a bit of the news article was devoted to the background of NAPRE member Lyman Bunting, now president of the Yakima firm. Bunting, who had arrived from Salt Lake City in 1911, learned about the company's operations by working on an ice wagon in summer vacation periods during his Yakima High School student days. He followed through during his college days until his return to teach agricultural and science courses in the high school. In 1915 Bunting quit teaching and joined the company on a full-time basis, in due time being elected vice-president and now president.

Another member who acquired practical experience with the Artificial Ice & Cold Storage was Howard H. Peterson, now a Consulting Engineer in Yakima, and a National Past President of NAPRE.

Colton

HARRY BONTER

ON JUNE 8, members and friends were guests of Carl Hooker who took the group for a tour through the Exchange Orange Products Co. plant at Ontario, Calif. Here they process oranges for juice, oils, pecton and various kinds of concentrate for making different kinds of drinks, and flavoring in cooking and baking. The waste or pulp is dehydrated in large kilns, then sold for cow feed. The group spent considerable time in the boiler and compressor room. The refrigeration plant has a capacity of about 700 tons refrigeration for freezing and chilling purposes. At the end of the trip Brother Hooker took the group to the cafeteria for coffee and donuts.

Our July 13 meeting was held at the Santa Fe ice plant lunch room, San Bernardino. Voted in as a new member was Herbert F. Buller, engineer, National Ice and Cold Storage Co., Riverside, Calif. Mr. Frank Scherer then took up his class lecture which was followed by talks on precooling of various kinds of fruits and commodities in storage for a long period of time. The meeting closed with the usual lunch.

NAPRE Convention Announces Interesting Program for Ladies

WM. RAY BURNETT
General Convention Chairman
Director, NAPRE

When asked to elaborate on convention activities, Director Burnett wrote: "Being an old hand at promoting, I'm sure pleased to have the opportunity to tell the two previous would-be promotors of this convention that they certainly pulled a big boner. They slighted the ladies! Our convention won't be a success without them. As a native Texan, and Southern Californian by adoption, my up-bringing and experience long ago made me aware of their importance. Therefore, my article is headed up by their program. When the wives see what we have to offer, our problem will be to take care of the overflow of registrations!"

CONVENTION arrangements, from NAPRE's origin in Shreveport, La. in 1910, have always included "education" and entertainment for the ladies. Los Angeles has always in several previous meetings held here, done an exceptionally good job of seeing to the needs of the "better-half". The chapter is out to do it again.

Co-Chairwomen

Appointed as co-chairwomen are Mrs. Regis Gubser, spouse of the National President, and Mrs. Elmer A. Johnson, wife of the California Chapter No. 2 President. Members of the committees have not figured out, as yet, how the ladies will divide their responsibilities, but we are certainly impressed by the fact that preparations are well under way and that the girls are in a position to present their tentative program at this early date. The ladies' program arranged thus far, is as follows:

The Ladies' Program

November 8, 8-11 A. M.—Registration, Convention Opening, Get-acquainted Hour.
2-4 P. M.—Choice of Farmers' Market Tour or TV Shows.
7-9 P. M.—Card party.
9-11 P. M.—Annual informal party.

November 9, All Day—Sightseeing trip to Walt Disney's Fabulous Disneyland.
6:30 P. M.—Exhibitor's Frolic.
8:00 P. M.—Theatre Dinner at Famous (Academy Awards) Moulin Rouge.

November 10, A. M.—Choice of sight seeing around Los Angeles, or shopping tour.
6:30 P. M.—Reception & Annual Dinner.
9:00 P. M.—Dancing.

Director's Meetings

Preceding the convention, on Monday, November 7, the Board of Directors will meet. The NAPRE Board of Advisors consisting of all past presidents, will attend, a custom established in 1952 by Past President A. R. Carlson, now Vice-President of City Products Corp. This year the members of all national committees have been extended an invitation to attend the board meetings. Chairmen of standing and special committees will make their reports in person and will have an opportunity to observe the handling of Association business. The board meeting will follow a "Dutch" lunch, meaning, of course, that the officials and committeemen come prepared to buy their own. Another board meeting will follow the convention activities on Friday, November 11, at which time the new officers will have an opportunity to elaborate on their aims and objectives for the coming year.

The first engineering session of the 46th annual meeting will get under way at 10:00 a.m. Tuesday, November 8, with NAPRE's educational chairman,Harold P. Hayes presiding. Three papers are scheduled for that morning session: automatic ice plants, topic one, the United States Naval reefer ships, topic two, and refrigeration for fishing vessels, third. The paper on the automatic ice plant will cover the 400-ton installation described in the February, 1953, issue of *Ice and Refrigeration. Improvement since that time on two* subsequent plants, 400 and 500 tons, will be cited in the paper. The refrigerated vessels are the first to be built by the Navy from the keel

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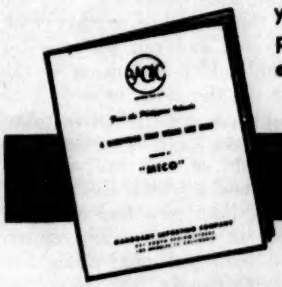

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up as reefers. Previously the Navy has always converted merchant vessels for this purpose. Not only the refrigerating plant innovations will be of interest, but also the very modern methods of handling cargo in and out of the refrigerated holds and compartments.

Air Conditioning Topic

Engineering sessions scheduled for Tuesday afternoon include the discussion of air conditioning for public buildings, the application of central refrigerating plants to large shopping centers and super-markets, and a creamery paper. Not only new construction will be covered in the air conditioning paper, but conversion of existing heating and ventilating plants, to air conditioning will be discussed in the first paper on that session agenda. Pros and cons will be presented on the use of central station equipment in some of the large California shopping centers, involving large drive-in, cash and carry grocery establishments. The creamery paper will bring the members in attendance up-to-date on modern dairy, creamery, and ice cream manufacturing practices, including the use of ice building or latent heat facilities. This second engineering session will be presided over by the assistant educational chairman, Guy R. King, author of *Basic Refrigeration*, the official NAPRE text.

Operating Cost Discussion

Traditional opening day session, The Bureau of Refrigeration Information, will be conducted under the direction of Frank Elliott, as moderator. A panel of NAPRE members will present their views on promoting plant efficiency. The panel will consist of engineers from many various industries employing refrigeration and from all sections of the country.

An interesting type of meeting started at the last convention in Los Angeles, 1951, will take place on Wednesday morning. It will be a breakfast meeting. A chapter clinic will be conducted by members of the Los Angeles chapter. Chapters all over the United States have been invited to submit problems of chapter growth, membership, educational facilities, etc. Each problem has been delegated to a member of California Chapter No. 2, who has had the most experience in the particular subject. Following that business session, there will be presented two more engineering topics. One topic will involve heat transfer principles and will be lectured on by Guy R. King. A safety meeting will follow. Wednesday afternoon is left open for the men to enjoy a field trip of their selection, or participate in a golfing tournament.

Railroad Car Discussion

On Thursday, November 10, there are scheduled four more papers on refrigerating topics. Under the direction of Dean Harold P. Hayes, a report on corrosion prevention and protective coatings for the refrigeration industry will be made. A second paper will be on vacuum cooling; new developments and use of ice, in this refrigeration application. The afternoon's topics will involve the maintenance and servicing of mechanically refrigerated railroad cars, and construction methods for new breweries. A business session will precede the educational forum in the morning and follow the afternoon engineering program.

The ladies program included here and previous articles on the convention, give members and guests alike an idea of the more relaxing activities planned. Members of this chapter are hard at work planning a wonderful time for all attendants. If New Orleans thinks they put over an exceptional convention last year, the Los Angeles committee challenges them to turn out enmasse to witness their subordination in the field of convention handling.

Ammonia Float Exploded

THE FLOAT in the ammonia chamber on a cooling unit sprang a leak and was no longer functioning. Two employees removed the chamber and took it to the shop to put in a new float. The chamber was disassembled and a new float put in. The old float lying on the bench was covered with frost and ammonia could be heard splashing inside when the float was shaken.

The two men decided to test the float for the leak and so they took it to the sink and ran warm water on it. The sudden expansion of the ammonia in the float caused it to explode like a hand grenade. Ammonia got into their eyes. One man lost the sight of one eye and the other man had a partial loss of sight in one eye. Both men had had long experience in this work and apparently the principal motivation was curiosity. Obviously, the safe procedure is to dispose of these defective floats where they will cause no harm.—National Safety Council Safety News Letter.

Amended Grade Standards For Frozen Lima Beans

THE U. S. Department of Agriculture has announced an amendment to the current grade standards for frozen lima beans to become effective July 15, 1955. The amended standards revise the current grade standards which have been in effect since July 17, 1953, to provide for the use of USDA color standards for frozen lima beans and clarifies the definition of harmless extraneous vegetable material. Information concerning procurement of sets of these color standards may be obtained from the Fruit and Vegetable Division, Agricultural Marketing Service, U. S. Department of Agriculture, Washington 25, D. C.

Since good packing practices will not be affected and since the industry will benefit by the earliest effective date, no prior notice of the amendment has been given. The grades for frozen lima beans are U. S. Grade A or U. S. Fancy; U. S. Grade B or U. S. Extra Standard; and U. S. Grade C or U. S. Standard.

Hartford Freezer Corp. To Open New Warehouse

THE NEW one million cubic foot capacity freezer plant under construction for the Hartford Freezer Corp. in East Hartford, Conn. is well advanced and the plant operation is scheduled for this Fall. The building is one floor construction, served by a 10 car siding of the New York, New Haven & Hartford RR, and multiple door truck dock adjacent to a truck arterial.

The plant is the first modern frozen warehouse constructed in the area for many years, and will include blast freezer facilities, the latest temperature control and recording devices, and specially designed mechanized equipment for economically handling the 270 carload plant capacity. Operation is scheduled for October and will serve Southern New England in the distribution of frozen and refrigerated merchandise.

New Dry Ice Plant

THE Standard Oil Company, Ohio, plans to add an $800,000 dry-ice plant to its $17 million petrochemical plant under construction at Lima. The new carbondioxide unit will have a 75-ton a day capacity and will be in production by May 1, 1956.

Modern Office Building Heat Pump Application

FRED C. BARTON
Registered Engineer
Indianapolis, Ind.

THE EMPIRE Life Insurance building located in Indianapolis, Indiana, constructed in 1950, incorporated the most modern methods of construction and was furnished every known device to obtain the most efficient building whose obsolescence would be a minimum over a fifty year period. The present building is 180 feet long by 120 feet wide, full air conditioned two floors and basement. Ultimately designed for twelve floors, additional levels will be added two floors at a time.

The building is constructed of Bedford stone trimmed in black marble and is most attractive. A large auditorium seating two hundred persons, together with snack bar, custodian living quarters, file rooms, storage and machine rooms are located in the basement. General offices are located on first and second floors. Private and executive offices are located on the front wing of the second floor. Music and public address systems are installed throughout the building; also Lamson conveyor tubes.

Type "Q" floors are used throughout so that phone, power, lights or public address system outlets may be installed in the floor in any location at a future date. All mechanical and electrical systems were designed and installed for the future additional ten floors. Expansion is therefore possible at the lowest possible cost.

Well-water Source, Heat Pump

Air distribution system throughout the building is the double duct (hot and cold) system for both cooling and heating, so arranged for future expansion that any partition may be located for expansion or change in occupancy, without redesign or alteration of the air system. Taps are merely made in the bottom of the ducts, with automatically controlled mixing dampers installed so that the right proportion of hot and cold air will be delivered to any one location in accordance with its heating or cooling requirement.

Year round air conditioning is obtained by an ingenuous engineering design which incorporates use of the heat pump for partial heating and temperature control, and uses these same heat pumps reversed to cool the building. Heat for the heating cycle, obtained from well water, vaporizes the refrigerant which is then compressed and elevated further in temperature by the heat pumps. Refrigerant then transfers its heat to the condenser water which is circulated through the heating coils, heating the air.

Before detailing the system further it might be in order to briefly review the history and definition of the heat pump. A pump is defined in the dictionary as a mechanical device for raising, circulating, exhausting or compressing a fluid. Strictly speaking there is no such thing as a *heat pump* because heat is a manifestation of energy, and consequently, it is not physically circulated or compressed as in a refrigerator. Actually a refrigerating cycle increases thermal potential, so by analogy it is easily comprehended as a heat pump. Simply stated, the heat pump obtains heat at one temperature, then raises it to a higher level by adding the heat of compression approximately equal to the compressor power input.

Although Lord Kelvin suggested ninety years ago that buildings could be heated by reversing the refrigeration cycle, it has only been in the last twenty-five years that concentrated research and development work has been done to take full advantage of the heat pump possibilities.

Business Earning Power and Economics Selected Plant

Returning again to our subject of justification for the application of the heat pump to Empire Life building, it was strictly a matter of engineering economies. Although the present building is only two stories and basement, the ultimate building planned by D. A. Bohlen and Son, Architects, was to be twelve stories. This of course required building space for mechanical equipment for the entire twelve floors. An analysis of the present heating load and the future additional ten floors disclosed the fact that the boiler rooms and chimney space would have to be adequate for 35,000 sq. ft. of radiation, requiring a sizeable boiler room and valuable building space for such a large chimney the entire height of the building.

Ammerman, Davis, and Stout, Consulting Engineers, were instructed to air condition the entire building. Therefore, the investment in refrigerating equipment required for cooling and dehumidification would have to be used only about one third of the year. Additional return could be earned on this investment the remaining two thirds of the year if this same equipment were used as a heat pump. This would also reduce investment in heating boilers, chimney radiation, piping, etc. and release valuable building space for added income.

Calculations disclosed that the refrigeration required to air condition this building if reversed would be more than adequate to heat all the outside air required for ventilation. This was a sizeable load. Due to the large building population, this ventilation load amounted to 20,510 sq. ft. of radiation for the twelve floors, or 58 percent of the entire heating load.

Heating Plant Provided to Offset Conduction Losses

By reversing the refrigerating cycle, heating plant investment and its building space requirements could be reduced approximately 50 percent. Heating equipment was only provided then for building conduction heat loss. This design seemed desirable and flexible since the danger of building freeze up in cold weather due to power failure or equipment breakdown, would be prevented. Heating equipment adequate for conduction losses would hold building temperatures sufficiently high at nights and weekends so that refrigerating equipment and all fans could be shut down, reducing operating costs and maintenance materially.

It was determined that there was adequate 55F well water available at this building site that could be used for condensing water on the cooling cycle, and as source of heat

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The late Prof. H. G. Venemann had been scheduled to deliver a paper on this heat pump application for the 45th Convention, NAPRE, with the collaboration of Fred C. Barton, the designer. Director Roy T. Burns delivered this printed account, based on Mr. Barton's notes, gotten together hurriedly following the Professor's decease. Mr. Barton therefore invites correspondence pertaining to his design, with the hope that he may further elaborate for interested parties. He is a member, NAPRE, ASRE & ASH&AE, and associated with Ammerman, Davis & Stout, Inc., Engineers.

on the reversed cycle. Since the air conditioning load for the present two stories and basement was 220 tons refrigeration, two 110 ton chilled water systems were selected for flexibility. Chillers are full flooded type and compressors are reciprocating. Future expansion will be handled by similar packaged unit increments.

On the Summer cycle each chilled water system produces 110 tons refrigeration operating at 40F suction temperature and condensing at 95F, while requiring 225 gpm 55F well water. For the Winter cycle each chilled water system cools 225 gpm 55F to 45.3F, while heating 200 gpm 85F condenser water to 98.4F which is circulated through heating coils in the fan systems. In the reversed Winter cycle each chilled water system rejects to its condenser 1,340,000 btu's with 88.9 KW imput to its compressor motor. The heat pump then releases

$$\frac{1{,}340{,}000}{15{,}100}, \text{ or } 15{,}000 \text{ btu/kwh}$$

Since the heat equivalent of one kwh is 3415 btu, the actual coefficient of performance is

$$\frac{15{,}100}{3415} \text{ or } 4.43.$$

Theoretical Carnot coefficient or performance is

$$\frac{40 \text{ plus } 460}{(115 \text{ plus } 460) - (40 \text{ less } 460)}$$

or 6.68

Fuel Oil vs KWH Costs

Stated otherwise — by obtaining heat from 55F water, raising the temperature head to 98.4F through the reversed cycle, 15,100 btu is obtained for each 3415 btu of electrical energy.

Economically then, 140,000 btu/gal. fuel oil burned at 75 percent overall boiler efficiency and costing 10.4 cents per gal., would equal heat pump current costs of 1½ cents per kwh under these conditions.

Anticipated economies have been realized in practice. Actual operating costs of the heat pump with power costs of one and one half cents per kwh, has averaged seventy percent of the cost of heat obtained from the heating boiler using fuel oil costing 14½ cents per gallon. Consequently, the heat pumps have been used in place of the boiler to obtain lower operating costs.

Split System Operation

During the Spring and Fall, when heating is required in the shaded part of the building and cooling is required where the solar load is large or where building internal load is heavy, one unit is operated as a heat pump while the other is operated on the cooling cycle thereby simultaneously heating and cooling the building. All equipment is automatically operated except the changeover from heat pump to cooling unit, which is accomplished manually by throwing a hydraulic switch which changes the position of four threeway valves which are linked together. The refrigeration cycle operates the same on both heating and cooling cycle. The flow of condenser water and chiller water are reversed to change from one cycle to the other.

This installation at Empire Life has now operated through three winters and three summers. Extreme temperatures and sudden changes in outdoor temperatures have not presented any operating difficulties. Temperatures and humidities throughout the building have been maintained at thermostat settings, plus or minus one degree. Officers of the organization are very well pleased and state that this installation has attracted more attention locally and nationally than any of the other outstanding features.

Chicago Building Uses Earth Heat Source

ION CALOGER
Ch. Eng., Refrigeration Systems, Inc.
Chicago, Ill.

A HEAT pump was designed and installed at the new office building of Midland Development Co., on the North side of Chicago in the fall of 1954. The building is a one-story structure with full basement, measuring approximately 50 x 60 ft. It had exposed walls on all four sides, until very recently when an addition was built adjacent to the east wall.

The earth is the only heat source for this year-around heating and cooling system. A grid of ½-inch galvanized pipes is buried four feet below grade. An alcohol and water solution is chilled and circulated in this grid of pipes, thereby extracting heat from the earth. The temperature of the water-atcohol solution varies and becomes progressively colder as colder weather sets in. The lowest recorded temperature of the solution has been 18F. However, since the earth surrounding the pipes is always at a higher temperature, heat is transferred from the earth to the pipe and from the pipe to the solution.

Heat from the water-alcohol solution is transferred to the "Freon" refrigerant through a shell and tube heat-exchanger (chiller), in which "Freon-12" refrigerant is evaporated and the solution chilled. The evaporated Freon is carried into the suction of a conventional reciprocating compressor, where its pressure and temperature is raised by compression and carried through a hot gas discharge line to a condenser coil, which serves as the air heating surface in winter. The refrigerant is condensed in this coil and accumulated in a receiver, and from there it is piped through an expansion valve to the chiller, to repeat the cycle.

Summer Cooling Cycle

In summer the cycle is reversed. The chiller becomes a condenser and the water-alcohol solution dissipates the heat of condensation into the ground. The air heating coil becomes a direct expansion evaporator for cooling the air, as in a conventional air conditioning system. It can be seen therefore that this system is of the direct type, in-so-far as the inside of the building is concerned, and of the indirect type as far as the heat source or sink is concerned.

The compressor is a 15 hp machine, and operates at a back pressure of approximately 15 lbs. and a head pressure of 150 lbs. The circulating pump for the water-alcohol solution is 1 hp. and the fan motor for distribution of the air is 1½ hp. The total amount of air moved is approximately 3,500 cfm and by test the heat pump delivers approximately 110,000 btu's per hour, with a compressor motor loading of 12 KW. In addition to the output of the heat pump there is 10 KW's of installed electric heaters, primarily

(Continued on page 45)

Description of the earth source heat pump in this article, is the presentation made by Mr. Caloger to delegates at the NAPRE Midwest Regional Educational Conference who visited this plant on one of five selected field trips. Caloger, a member of ASRE is the designer of the system. His description was intended to give a general idea of this installation, and does not cover the design features of the system.

Cunard Building Air Conditioned

THE installation of one of the largest and most complete air-conditioning systems in an existing structure was recently completed at a cost of more than $3,000,000 in the Cunard Building at 25 Broadway, New York. The twenty-two-story building, a landmark in the lower Broadway area, has a net rentable space of 580,000 square feet and over 100 tenants.

The engineering for this project commenced in April, 1953. The actual installation was completed in eleven months, with most of the work being done during normal business hours and overtime reduced to a minimum.

A contract was awarded to Kirby Saunders, Inc., for the complete installation of the building's air conditioning system.

The installation consists of a central refrigeration plant located in the sub-basement made up of two steam turbine driven centrifugal York compressors of 935 tons each. Chilled water is distributed through sixteen-inch supply and return lines.

In order to meet city requirements it was necessary to erect a cooling tower on the roof. This was installed without the need for extra support when the existing steel was determined to be more than adequate to carry the additional load. The tower is also supplied by a sixteen-inch supply and return.

How to get these lines through the building and the supply of fresh air to the air handling units presented a problem. Rather than construct a shaft through the various floors, it was decided to use two elevator shafts for the chilled water risers, as well as for the fresh air supply. The problem was further simplified by an existing ventilation shaft which was used to run the condenser water pipes.

The original intention was to install a conventional system of air distribution throughout the building, with one central air handling unit on each floor. However, three of the building's major tenants occupying floors twelve to twenty-two preferred a system that would allow more individual control. After a further engineering survey, it was agreed to install the fan-coil system on these floors, thus permitting individual control at each unit. This change resulted in the major problem of having to pipe chilled water to each of the fifty-six risers at the eleventh floor and was only accomplished through the great co-operation of the tenants involved.

Another difficulty was the air-conditioning of the great hall, one of the show places of lower Manhatan. This hall is approximately 65 feet by 185 feet and is four stories high with travertine surroundings and an ornate, domed ceiling. However, it was serviced very successfully when the existing ductwork was utilized.

An unusual aspect of the installation is the I.B.M. electronic control board used for the starting and stopping of all air handling and fan-coil units. It is believed to be the first installation of its kind applied to an air conditioning plant.

During the off season, a 100 percent supply of fresh air is delivered throughout the building, and during the heating season the upper floors work on a reverse cycle, with hot water circulating through the fan-coil units and tempered fresh air supplied by the primary air handling unit.

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Regular Inspections A Must

As most engineers know, the necessity of regular inspection and maintenance in order to prevent accidents and the resulting outage of equipment is of prime importance. In those plants which operate steam boiler for power purposes, regular periodic inspection by commissioned inspectors is a must. Since the design, fabrication, installation, and inspection of steam boilers is governed by a uniform body known as the American Society of Mechanical Engineers and the National Board of Boiler and Pressure Code, periodic inspection of these objects does not present any real problem. Actually, these plants are mostly regulated, coming under the jurisdiction of many states and municipalities who embrace this code in its entirety.

However, where the prime movers are turbine generators, reciprocating steam pumps, or engines driving compressors, too little attention is given to inspection and maintenance until there is some indication of impending trouble. In this type of plant an operating log should be kept for each 24 hours of operation. This log can be designed and planned for each particular plant. Regular readings by the operating engineer should be taken at periodic intervals. These readings should be placed on this log or chart for future information and reference.

Mechanical equipment today is provided with various operating gauges, charts, thermometers, tachometers and many other operating appliances and appurtenances. These are all designed and installed for one specific purpose; to prevent an accident or to prevent unnecessary wear and tear on that particular piece of machinery, which in the future might mean costly repairs. If the plant personnel does not make practical use of these instruments and gauges, and the story they tell about that particular piece of equipment,

C. D. Drane

then management is ignoring the facts which might lead to a serious accident or breakdown, the loss of production, and in all possibility the contamination and loss of goods under refrigeration.

Benefits Derived By Study Of Industry's Own Accidents

Engineers should profit and take advantage of accidents which come to the industry's attention. In so doing and developing the cause, all gain a wealth of knowledge which might prevent a similar accident in their own plants. Following are some cases which have come to the attention of insurance service engineers:

Case 1: This particular plant located in Los Angeles was insured for Direct Damage, U. & O.[1] and Consequential. The accident was to ammonia piping forming part of a 150 hp compression-type refrigerating system employing brine sprays for refrigerating meat in a packing house operation. The pipe that ruptured was part of an ammonia evaporating coil submerged in a brine tank. The inspection engineer's report shows that corrosion had reduced the pipe wall thickness so that pressure of ammonia was sufficient to cause the rupture.

Result of this rupture was that released ammonia was pumped with the brine to the cooler room where it was released at the spray heads to make contact with the meat in storage. When this occurrence was first noticed, salvage operations were immediately begun under the direction of the assured and the Federal Meat Inspectors. The cost of the salvage operation amounted to about $10,000, and the loss to the meat that was hanging in storage was approximately $47,000.

Case 2: This derangement was in a plant located in New York City which was insured for Direct Damage, Consequential and also U. & O. One morning a corroded pipe nipple ruptured, discharging approximately 3,000 gals. of brine before it was discovered. Veal, beef and pork valued at $35,000 in the assured's cooler were thoroughly sprayed with brine. Meat products valued at another $6,000 owned by another butcher and stored in an adjacent cooler were soaked as a result of seepage. Both the assured and other party did everything possible to minimize the loss, making salvage substantial in each case. The assured's loss finally amounted to $16,000, and the other butcher's was approximately $3,300.

Many Great Dollar Losses Caused By Little Things

Case 3: Another accident which rates attention and which points out the necessity of regular inspection and maintenance, happened to an ammonia compression refrigerating system. An accumulator (½-inch) drain pipe in the cold storage room was broken off when it was struck by a small portable truck used for moving products into and out of the room. The room contained deep frozen beef and pork. Although immediate measures were taken to remove the affected meats from the room and dissipate the fumes, ammonia had penetrated the products to an extent that it was necessary to trim the carcasses and dispose of the unaffected portions at a reduced price. *The strange part of this case is the cost of repairing the broken pipe was less than* $1.00. *However, the contamination loss amounted to approximately* $1700.

Case 4 is another accident to an ammonia compressor-type refrigerating system. Again a ½-inch ammonia pipe in a cold storage room was broken when one of the employees stepped on it. The cost of

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C. D. Drane, engineering department supervisor of the Fidelity and Casualty Company of New York, is a native of Pittsburgh, with 19 years practical and inspection experience in the pressure vessels field. He is a member of the American Welding Society and ASME, with All States Commissions in the National Board of Boiler and Pressure Vessels Inspectors.

[1]Use and Occupancy

repairing the piping was negligible. However, contamination loss amounted to approximately $16,000.

In another *case* (5) involving a "Freon" compression-type refrigerating system, a leak developed in a condenser tube and as a result the "Freon" was contaminated with water. A short time after the defective tube had been replaced and the system returned to service, the piston in the "Freon" compressor seized. It was discovered that the pistons, piston rings and cylinders had been seriously corroded. The corrosion was caused by hydrofluoric acid formed after the "Freon" came in contact with water.

System Failures Classified

Over a period of many years experience it has been found that the causes of failures develop into some four different classes: today, it appears to be the rule, rather than the exception, that refrigeration equipment is overloaded, which means the plant is working above its designed rating. Cold storage of food products as a business has been going through a rapid expansion. Consequently, there may be breakdown or equipment failure which was not previously anticipated.

Failure of piping and pressure vessels in refrigerating systems has been due to corrosion in approximately 35 per cent of 200 cases investigated. Of these same 200 cases, it was estimated that over 20 per cent of the failures could be laid to carelessness.

Next in order are piping casualties; defective materials and workmanship, excessive pressure, vibration, lack of proper maintenance, and poor supports. It has been found that parts which first fall are: coils in the cold room, coils in the brine cooler, tubes in condensers, coils in water coolers, and high pressure gas and liquid lines.

Last but not least, are failures in pressure vessels, gauge glasses and gaskets. They are not too frequent and possibly they are given more attention than other pipe lines.

Brine Corrosion Problems

It has been established that corrosion presents a problem in most refrigerating plants, and particularly those with brine systems. This fact was responsible for a careful study[2] by a committee of the American Society of Refrigerating Engineers, which recommended maintaining brine in a neutral condition, neither strongly acid or alkaline, as an aid in reducing corrosion. Fresh brines tend to be alkaline, and ammonia leakage increases alkalinity. Exposure of air causes absorption of CO_2, making the brine acidic.

Acidity can be cured by the addition of caustic soda or slaked lime; alkalinity by air blowing, by bubbling CO_2, or by the addition of sodium bicarbonate. Unless definite tests indicate how much treatment is required, the best bet is to treat in small doses until brine tests slightly alkaline with litmus or phenolthalein.

An efficient refrigerating brine must remain liquid at the lowest temperature at which it is to be used, and its corrosive effect on piping and metal equipment must be held to a minimum. Operating at low temperatures requires brine at higher specific gravity, which results in its having a lower specific heat. Corrosive brines cannot be tolerated because replacing equipment is costly. Since iron corrodes more readily in brine of low pH and zinc is damaged at relatively high pH values, it is vitally important to maintain the pH level at the best intermediate point (approx. 7.5 to 8.5).

To further reduce corrosion, keep air out of brines, maintain brine at proper level so air will not be sucked in, see that the return brine lines discharge under the surface, and keep brine up to strength. Weak brines take up air faster than strong ones. The design of brine systems should avoid use of dissimilar metals which foster electrolytic corrosion.

NH_3 Detection in Brines

Escape of ammonia into the atmosphere is easily detected, but in a submerged condenser, brine tank, or brine cooler it is necessary to examine the surrounding liquid to determine whether or not any leakage exists. For this purpose various agents are employed, which may be obtained from druggists or the manufacturers of ammonia. Red litmus when dipped into water or brine contaminated with ammonia will turn blue. Litmus paper may not give reliable results when dipped into strong alkaline calcium-chloride brine because this salt itself tends to turn the paper blue. Gas leaks in open air are usually checked with sulphur sticks.

Nessler's solution can be used to test calcium-chloride brine for free ammonia if enough sodium carbonate is added to sample to precipitate the calcium. Filter the sample and add several drops of Nessler's solution. Color becomes yellow to dark brown if ammonia present. Stopping of an ammonia leak in the brine tank or cooler may be possible while the plant is in operation, by shutting off the coil in which it occurs; or, if the point is accessible, a clamp and gasket may be put in place temporarily.

Air is often used to test a refrigeration system, but no oxygen or any combustible gas or combustible mixture of gases shall be used within the system for testing. Refrigeration ordinances and codes require "minimum refrigerant leak field test pressures." Particular care and precautions should be observed as a thorough purging of all air from the system is necessary before placing it in service.

It is evident from the experiences noted herein that refrigeration systems which have a contaminated exposure require frequent inspection. A minimum of at least one annual inspection is considered as being necessary. The inspector should give particular attention to the corrosive effects of various brine solutions on the different materials. It is well known that serious corrosion can occur unless the pH value of the brine is properly controlled or suitable inhibitors are used.

Practical Inspection Hints

Refrigerating piping may be in locations, such as through floors or walls, or in damp places, that are particularly susceptible to either internal or external corrosion. All piping should be installed so that it may be periodically inspected, at least once every six months. Do not use a hammer to tap a pipe under pressure, especially if a section is corroded. To determine if a corroded area is weakened, first close off the pressure and then tap for a check of strength. Some plants may employ chemists who set up a system for brine control and metal protection. The inspector should note this fact on his report to the underwriter and for his own records. Carelessness or inattention of the operating personnel or other employees can be corrected by proper supervision and education. Suitable caution signs should be posted at vulnerable locations such as at loading platforms or passageways. Carelessness in manual defrosting should be carefully watched and

[2]Corrosion Report, 1944.

eliminated by use of wooden, hard rubber or other non-metallic tools.

It has been reported that some success in decontamination of food stuff is attributed to "Air-Kem". This is a relatively new method, however, and apparently has not been perfected. The "Air-Kem" is sprayed into spaces which have been contaminated by refrigerants, its function being to absorb said refrigerants in much the same manner as water sprayed into a room containing ammonia fumes. Thus far it has not proved successful in spaces held at low temperatures because of the tendency of the "Air-Kem" to freeze.

Closer cooperation between insured and the insurer will have a tendency to improve plant operating conditions, minimize the possibility of accidents and outage on equipment. To lessen the possibility of contamination or loss of production, the wealth of knowledge gained over a period of years by the insurance companies through accidents which are closely related to the refrigerating industry, can be of value not only to the company but also to the industry. Business ethics do not permit the insurance company or the inspector to give specific names or locations but the accidents can be discussed, the cause developed, the resulting loss can be quoted, and if the cause is known then corrective measures can be taken.

Instruments for Inspection

Regular periodic inspection and maintenance is a must. In order to provide this, the engineering departments of the various insurance companies are equipped with several thousand dollars worth of instruments which are designed and used for the prevention of accidents and their resulting losses. Among these are the magniflux, which we are licensed to use and which is used for the detection of suspected cracks in boilers, crank shafts, pressure vessels and all other types of machinery and pressure vessels which are exposed to this type of hazard.

Also available for use is the electric megger, an instrument which is used on electric equipment to determine the resistance of the wiring and the windings, and to note a breakdown or general deterioration in the resistance. In those plants which are operating large electric motors and power is supplied by a public utility, the regular use of this instrument should not be overlooked. On prime movers using electric motors for power, tachometers are also provided for the testing of overspeed tripping devices and for determining safe speeds of motors, turbines, generators, engines and all similar types of equipment.

The stroboscope is also available; an instrument which is primarily designed for obtaining the rpm of equipment without putting any load on the equipment. This instrument can be used for the smallest fractional hp up to any including the largest motors, turbines and generators. It can also be used to advantage in completing a rather thorough inspection of the equipment where it is running and cannot be taken out of service. Insurance services have at their disposal the audi-gauge, an instrument which works on the electrical resonance principle and uses the scale of harmonics in determining the thickness of various metals; without the necessity of boring and gauging, and resultant plugging as in the past.

Inspection Service Gratis

Most of these instruments are very expensive and for the small plant it probably would not be a wise or practical investment. However, these are all available and are purchased, maintained and operated with one purpose and these thoughts in mind; a service to our insureds, as a means to prevent accidents, and as a guarantee against loss prevention, with no charge made for use of the instruments or service. Engineers should not hesitate to call upon your insurer. You will find them very cooperative, that they will wholeheartedly work with you in your problems, and will be of service that probably cannot be obtained anywhere else.

The man who works day by day in a plant gets to know the plant intimately; he has an operating knowledge of the various machines and motors that no outsider has knowledge of. Yet, his knowledge is restricted to a certain extent to that plant only. The insurance company inspector on the other hand doesn't have as intimate a knowledge of that plan as the chief engineer or the operating engineer. However, he does have knowledge of other plants and similar operations, especially the accident experience and their causes. This interchange of knowledge will go very far in the reduction of accidents and should prove to the advantage of the insurer and insured. Our company as an example, maintains a force of over 200 inspectors properly trained to conduct inspections of insured equipment. Our men are also willing and are capable of training your plant personnel in the use of the testing equipment which was mentioned. This item alone should merit favorable consideration by plant management and personnel.

1954 Accidents Reduced in Frequency and Severity

WORKERS employed by member companies of the National Safety Council chalked up their eighth consecutive year of record-breaking safety performance in 1954. They had fewer on-the-job accidents in 1954, and the ones they had were less serious. Industrial injury rates for last year, released by the Council in advance of the 1955 edition of its annual statistical yearbook, "Accident Facts," show a reduction in both frequency and severity of 1954 accidents as compared with 1953.

Twenty-eight of the 40 basic industry classifications reduced their frequency rates, and half of them reduced their severity rates. The average accident frequency rate for employees in all industries submitting company reports to the Council, based on the number of disabling injuries per 1,000,000 man-hours, was 7.22 in 1954 — a reduction of 3 per cent from the year before. The 1954 rate is just about half of the 1946 rate of 14.16.

The communication industry again led all others by turning in the lowest employee frequency rate. Its rate was 1.30. Electrical equipment ranked second with 2.50, followed by the automobile industry with 2.68. The relative position of these industries was the same in 1953. Pulp and paper showed the greatest improvement for the year with a 24 per cent decrease in accidents.

The average accident severity rate for all industries reporting to the Council, based on the number of days lost per 1,000 man-hours, was .80 last year — a decrease of 4 per cent from 1953.

Storage and warehousing reported a frequency rate of 5.02, a decrease of 22 percent from 1953; and a severity rate of .56, an increase of 100 per cent from 1953.

Is Inflation Increasing?

IF THE country is entering a period of inflation, purchasing agents should be the first to recognize it. But, says a staff writer in the Chicago Daily News, a report of the Purchasing Agents Association of Chicago on July business conditions reveals only a few of the recognized signs of trouble ahead.

It is true that prices are rising because of wage increases. The Business Survey Committee's report said 84 percent of the reporting concerns paid more for the important items they bought in July, while 16 percent reported that prices were unchanged. In June the price percentages were: higher 42, unchanged 58.

Balanced against this evidence of increased prices is the general attitude of purchasing agents to refuse to be stampeded into buying. On the basis of reports, there has been no unusual trend toward building up inventories. In the past, inventory speculation has accelerated an inflationary trend. A "close watch on inventories generally" seems to be the general attitude, according to Herbert H. Hill, survey committee chairman.

July inventories were up over June, said 30 percent of the reporting companies; fifty-seven percent said there was no change; and 13 percent reported that they were smaller. In June, percentages on inventories were: higher 32 percent, no change 55 percent, smaller 13 percent. Forty-nine percent of the companies said inventories were higher in June than last year.

Increases of up to five percent were reported by seven percent of the companies; five to twenty percent by 36 percent; 20 to 50 percent by six percent. Meanwhile 17 percent of the companies said inventories were smaller than in July, 1954. The decreases ranged to 30 percent, with the biggest group in the five to twenty percent shrinkage class.

A query as to inventories in relation to contemplated third quarter sales brought replies from five percent, who thought them too high; 82 percent said "satisfactory" and 13 percent thought they were too low.

Replies to questions on employment and production showed a less than season leveling off of activities. Order backlogs however showed moderate improvement.

Chicago Building Uses Earth Heat Source

(Continued from page 40)

for safety purposes, and also for heating the building at a fast rate when necessary. The total operating time of the heaters has not exceeded 10 per cent of the operating time of the motor.

Although no detailed record was kept of the outdoor temperature, running time, KW, input, etc., periodic checks of total KW hours were made, and the output of the heat pump, calculated by comparison with performance, when only the electric elements were on.

From the limited data that one heating season's experience has yielded, it can be said that the performance of the heat pump was very satisfactory. The space has been maintained at 72 to 74F, and the machine has cycled even when a temperature as low as 10F below was encountered. The cost of heating the building during one season has not, as yet, been determined. However, it is expected that operation will be slightly higher than that comparable to burning No. 2 oil. When this information is finally assembled an accurate evaluation of the economics of this installation will be made.

Air Conditioning Show Draws Increased Exhibits

THE NINTH exposition of the air conditioning and refrigeration industry, sponsored by the Air Conditioning and Refrigeration Institute, Washington, D. C., will be held in the Auditorium, Atlantic City, N. J., November 2 to December 1. More than 200 companies already have contracted for exhibit space and present indications are that it will be more than one-third larger than the last previous show held in Cleveland in 1953. Exhibits will occupy the first floor and stage of Convention Hall.

Five national groups will hold their conventions concurrently with the show. These include the Refrigeration Service Engineers Society, Air Conditioning and Refrigeration Wholesalers, National Commercial Refrigeration Sales Association, American Society of Refrigerating Engineers, and Refrigeration and Air Conditioning Contractors Association.

Canadian Ice Convention

IN PLANNING the annual convention, Directors of the Canadian Association of Ice Industries have found by experience, that icemen prefer to get away from big centers of population and the big hotels to surroundings that are different. That is one reason why Point Edward, Sarnia, Ontario has been selected and the Guildwood Inn will be headquarters. The convention will be held October 17 — 19. Then there is the interest of the Dow Chemical Company and the Imperial Oil Ltd., with the opportunity of a tour of both plants.

Speakers with a good fund of experience in the ice business will tell about new ways and methods.

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More on Insurance Article: "Are You Covered?"

HOW to buy insurance for the ice and cold storage industry, as covered in Max K. Doehler, Jr.'s article in February 1955, INDUSTRIAL REFRIGERATION, appears to have been a much needed article judging from letters received. Although some comments were invited from industry association representatives, it was not expected that letters would continue to be received on the topic. Excerpts from several more are published below:

Baltimore, Md

"I have reviewed the article . . . as Mr. Doehler's firm services this industry extensively, I thought that some of these remarks would be helpful to him.

"He writes, 'Fire damage alone ran nearly three million dollars a day in 1953. The industry could buy thirty ice or cold storage plants worth one hundred thousand dollars each, every day in the year with this money.' I question this for two reasons: (1) It seems to imply that a great deal of this loss is to our cold storage industry, which is not completely accurate; (2) His comparison of a cold storage plant of one hundred thousand dollars—; I think if he mentioned three at one million dollars, it would be more representative.

"Again, he states 'The average refrigeration plant cannot afford, and doesn't need an insurance manager.' Not a full time man perhaps; but you can buy this service at reasonable cost, and the manager is more or less a part-time manager to service your needs. It is my opinion that any plant can afford this as we have found, and some of the other members of NARW whom I have contacted on this subject have also found that they can afford it because of the savings that a person knowing insurance can make for them. For the warehouse manager to know insurance as he should, it would take a good deal of his time and divert his attention from the operation of the business.

"Again, referring to the explanation of fire insurance, the author has not touched on the subject of an agreed amount clause. This clause enables the property owner to know exactly what he is insured for and how much he will be taken care of on, in the event of a loss. In the 80 percent co-insurance there is always question as to the change in property valuations.

"It seems that most of the article covers insurance for ice plants and locker plants. It does not dwell too much on the refrigerated warehousing industry as there is no mention of warehouseman's legal liability insurance, nor any mention of the good fire record of our industry. Outside of this, there is a great deal of good information in this article."

A. G. JANNEY, PRESIDENT
Baltimore Cold Storage Co. and
Chairman, NARW Insurance
Committee
DALLAS, TEXAS

Southwest Heard From

Mr. Doehler has stressed very well, the importance of full coverage insurance on refrigerating plants and equipment, and also, he has stressed in good shape, 'Cost reduction factors'. We try to operate on the basis that we buy what insurance we think we need, and we do not buy what any company tries to sell us.

We carry some of our own insurance coverages. And, over a period of some 27 years, we have a good fire record. (I am knocking on my wooden head, because anything can happen.)

I think Mr. Doehler has done this article very well. It has called attention to many, many items, important ones which operators of these properties should know about, and I would have been very much pleased, had he put a little bit more safety cautions in the article.

W. F. LEONARD, JR.
The Southland Corp.
Chairman, Ice & Cold Storage Section
National Safety Council.

Professional Comments

CHICAGO, ILL.

After digesting the article . . . . offer a few comments, which I divide as follows:

Those which author skipped over lightly, as —

Author comments that if a plant is protected with automatic sprinklers, an amount of sprinkler leakage insurance should be carried, bases his contention on water doing just as much damage if accidentally discharged as if set off by fire. Statement should have been enlarged upon to point out amount of sprinkler leakage insurance needed should be determined by two factors: water damageability of contents; concentration of values in any specific section of the premises.

Under Comprehensive General Liability Policy explanation, I get the impression that the author considers this type of policy to give contractual protection. I feel it should be pointed out that, under the normal comprehensive general liability policy the contractual liability is limited to Lease of Premises Agreements, Railroad Side Track Agreements, Municipal Ordinance Agreements, and Elevator and Escalator Agreements. In a few instances, a company may be found which will grant blanket contractual liability coverage, but in this case the insured would be subjecting himself to a very definite increased premium at the time of audit inasmuch as any contract which held a Hold Harmless Agreement would be chargeable. Under the normal policy it is necessary for the insured to submit all of his contracts to his liability carrier who, in turn, will study the agreements and, if there is any contractual liability existing, will point it out to the insured along with making a premium quotation for the additional coverage.

Under the limits of liability I feel that it would have been in order to recommend minimum limits of liability of $100/300,000 for bodily injury and $25,000 for property damage, and at the same time give some percentage factors showing the relative small increase in premium from the basic limits. It should be stressed that the limits mentioned were minimum recommendations and on larger plants they should consider limits of $200,000 each person and $500,000 or even $100,000 for each accident on the bodily injury and, depending upon the exposure. $50,000 to $100,000 on property damage. There are some cases when property damage limits have been found to be insufficient even when the amount carried was $100,000; and

Those which author omitted, as —

If any plants have customers' goods on their premises, they are covered under the standard fire policy only when they are found to be legally liable or negligent. If there is no legal liability, the fire policies do not pay. If it is the desire of the insured to afford legal liability protection under his fire contracts, it is very important to remember that the values of customers' goods must be included in his own values so

that he is not going to suffer under the Co-insurance Clause. In many cases we find that insureds are now excluding this coverage from their fire contracts and carrying an All Risk Bailee Legal Liability Policy.

If the insured does not own the building which he occupies, it is also wise to look into legal liability insurance covering the building values which are a potential trouble spot in his insurance program.

Rent or Lease Liabilities

It is sometimes wise to look into the lease to see what provision is made for rents in the event a fire or other casualty renders the building untenantable. In some instances, a clause in the lease calls for a continuation of rent even though the building is untenantable. This hazard is picked up under the Business Interruption Insurance, if carried by the tenant and, therefore, makes it unnecessary for the building owner to carry rent insurance.

Sometimes this clause can lead into leasehold improvements made by the tenant. Normally the leasehold improvements are picked up by the building owner at the expiration of the lease. It can be made a condition of the lease that the building owner will repair or replace any damaged or destroyed leasehold improvements within a reasonable length of time, which would eliminate the necessity of the tenant carrying this coverage under his contents insurance. Instead, it will become a requirement that the building owner pick up these values under his building policies, The end result is that the tenant has protection under his lease and yet the insurance is carried by the building owner at a rate much lower than the contents rate.

Other Forms of Coverage

Other forms of coverage for ice and cold storages which should be discussed with competent insurance counsel are Broad Form Money and Securities Policy; Vandalism and Malicious Mischief Damage; Boiler Use and Occupancy; Accounts Receivable; Non-Ownership Explosion Insurance; Transportation; Valuable Papers; Water Damage, Collapse Insurance; Water Damage Legal Liability Insurance; Sprinkler Leakage Legal Liability.

On the whole, I thought that the article was very well written and informative. As it was written for national publication, it could not cover all aspects of the insurance business as it pertains to the refrigeration industry.

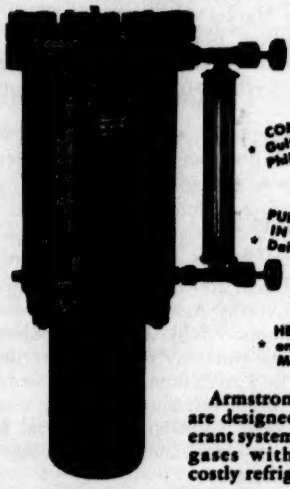
JOHN W. MURPHY
W. A. Alexander & Co.,

New England Ice Holds Annual Meeting

THE ANNUAL meeting of the New England Ice Association was held Wednesday, June 15 at the Kenmore Hotel, Boston, to coincide with the NAII Regional meeting at which Guy W. Jacobs and C. P. Austin represented the National Association. Mr. Austin presented 15 subjects, illustrated by slides, including vending stations, truck and car icing, hydrocooling, sanitation, legislation, ice carvings and bowls, and other merchandising subjects. Following each subject, a question and answer period was held.

At the business session of the Association the following officers were elected: President, Bernard Hogan; vice-presidents: Warren Peirce, Fred Murphy, Louis Richer, George Breen, and Edward Bennett. Directors: Fred Murphy, Don Elliott, Frank Gibbs, Warren Peirce, and John Kelleher. Raymond T. Miller was re-elected executive-secretary.

These People* have Profited . . . You Can Too!



5% GREATER CAPACITY, $250 MONTHLY POWER SAVING
* Planters Nut & Chocolate Company, Suffolk, Va.

COMPRESSOR CAPACITY RAISED 10%
* Gulf Oil Corporation wax plant, Philadelphia, Pa.

PURGER PAID FOR ITSELF IN 30 DAYS
* Dalton Ice Co., Dalton, Ga.

HEAD PRESSURE 50 LBS. LOWER
* on 90 ton ammonia system Mayo Hotel, Tulsa, Okla.

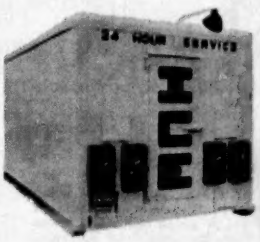
Armstrong Forged Steel Purgers are designed to *completely* rid refrigerant systems of all non-condensable gases without wasting a lot of costly refrigerant.

SEND FOR BULLETIN NO. 2211 — Contains complete information about the Armstrong Forged Steel Purger. Write:

ARMSTRONG MACHINE WORKS
860 Maple Street, Three Rivers, Mich.

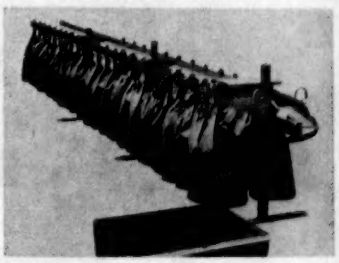
ARMSTRONG FORGED STEEL PURGER

Satisfaction Guaranteed



S&S presents DUO-RAIL

A Revolutionary Design in Bag Ice Vending Greater Capacity at Far Less Cost



9 x 10 ft. Vending Station

Mark II. Complete with Blower/Evaporator and Automatic Hot Gas Defrost. With 4 Vending Machines. Tremendous Capacity 10 or 12 lb. bags. Less than $4,000 delivered East Coast.

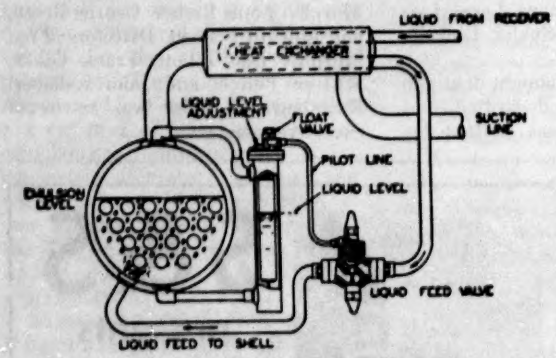
Write for Full Details

S & S Vending Machine Company

670 Lincoln Ave. San Jose, Calif.

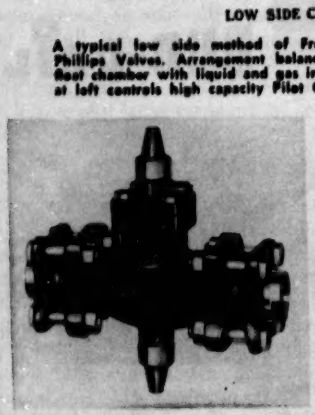
MODULATING-TYPE PHILLIPS VALVES INCREASE REFRIGERATION EFFICIENCY

A line of refrigerant valves that permit higher heat transfer rates and more stable operation of refrigeration systems has been developed by H. A. Phillips & Co., Chicago. The valves are the modulating type which automatically and continuously adjust the refrigerant flow to the refrigeration load. According to Phillips engineers, modulated refrigerant feed keeps evaporator tubes constantly wetted, insuring maximum heat transfer at all times. "Hunting" of system pressures and temperatures, a common occurrence with "off-on" refrigerant control, is also eliminated. Loading on compressors is more even, reducing maintenance problems. Phillips modulating controls include float valves for high and low side installation and both thermostatic and float pilot operated feed valves. They are applicable to a wide range of refrigeration systems.



LOW SIDE CONTROL

A typical low side method of Freon level control using Phillips Valves. Arrangement balances weight of liquid in float chamber with liquid and gas in evaporator. Float Valve at left controls high capacity Pilot Operated Feed Valve.



Phillips Float Valve for use with Pilot Operated Feed Valve. "Level Eye" on float chamber shows liquid level, simplies adjustments. An adjusting stem allows changing control level as much as 2 inches.

Phillips Refrigerant Feed Valves for both low and high side use are available from ½ to 8-in. pipe size for all refrigerants.

Write for full details and typical hook-up drawings.

PHILLIPS **H. A. PHILLIPS & CO.**
DESIGNERS AND ENGINEERS
REFRIGERATION CONTROL SYSTEMS
3255 W. Carroll Ave. • Chicago 24, Illinois

Civic Project May Relocate Chicago Warehouses

CHICAGO'S often "cussed and discussed" Fort Dearborn plan, revised, revealed again, and approved by Mayor Richard Daley, during the week of July 18, will displace four major refrigerated warehouses. They are Booth Cold Storage Company; two plants of the Central Cold Storage Company (Dearborn and Clark street plants); and Western Refrigerating Company, totaling nearly seven and a half million cubic feet of high and low temperature cold storage.

The new plan, made public by the project sponsors, would redevelop 147 acres, stretching from the river to Chicago avenue, and Rush to Wells street. It is a $288,100,000 job to be done cooperatively by government and private enterprise. The government area, called Ft. Dearborn Plaza, because of an elevated esplanade occupying 31 acres, would centralize administrative offices for local, state, and federal agencies. The project has been endorsed by the Chicago Plan Commission and by the Chicago Land Clearance Commission.

The Ft. Dearborn land, except for the government area, would be acquired by the Chicago Land Clearance Commission under the Housing Act of 1954. Thus the cost of acquiring property and razing existing buildings would be subsidized by federal slum clearance and urban renewal funds.

Warehouses Affected

Booth Cold Storage, Chicago plant, is one of four operated as subsidiaries of Booth Fisheries. This Chicago building at 109-121 Kinzie Street was established in 1912 and contains 921,055 cubic feet of freezer and 967,000 cubic feet of cooler space.

The Central Cold Storage Company, organized in 1916 with general offices at 350 North Dearborn street has 2,800,000 cubic feet of freezer space in the Dearborn street building and 633,000 cubic feet of freezer and 967,000 cubic feet of cooler space in the building at 325 North Clark street. The company has two other warehouses, the South Water Market plant at 1500 South Sangamon street and the Blue Island plant at 142nd & South Racine avenue, Riverdale, Ill., both of which are outside the boundaries of the present Ft. Dearborn project.

Western Refrigerating Company, operated since 1927 at 20 East Hubbard street provides 546,440 cubic feet of freezers and 441,650 cubic feet of coolers.

Railway Express Adds 200 More Refrigerator Cars

PURCHASE of an additional 200 high-speed refrigerator cars by Railway Express Agency, Inc. at a cost of $4 million has been announced by agency president, A. L. Hammell. It brings the company's expenditure this year for such equipment to $10 million. The new order for the 50-ton capacity express refrigerators to be used in passenger train service is an addition to the initial $6 million purchase of 300 cars announced in the April 1955 INDUSTRIAL REFRIGERATION.

The new units, as in the case of the original order, will be manufactured by General American Transportation Corporation at East Chicago, Ill. The new refrigerator cars will be placed in express service as they are received. Delivery of the additional units will begin late in the third quarter of the year. They are expected to help speed deliveries of fresh fruits, vegetables, seafood and other perishable commodities from widespread fields, orchards and producing areas to the nation's markets.

New Zealand Institute Elects Officers

RE-ELECTED as president of the New Zealand Institute of Refrigeration Engineers at their annual meeting held in Wellington on June 16, was J. L. Gichard, M. I. Mech. E, also a member of NAPRE and ASRE. Vice-presidents were P. D. Edwards and C. F. Lowe.

Mr. Gichard's report as president devoted considerable comment to education of refrigeration engineers. Apparently during the 1954-55 term the New Zealand group was successful in setting up an apprenticeship program, including arrangements with some technical or vocational schools for this apprentice training. The immediate objective of the Institute now is to have refrigeration courses set up at a University level. They have applied to several universities and to the New Zealand Minister of Education for that purpose. Among some of the statistics cited for the Education Minister is the fact that New Zealand, since 1882, has produced products exported under refrigeration amounting to over 4½ billion dollars up to 1953.

In his report Mr. Gichard comments "It is a remarkable thing that most countries in the world are refrigeration-conscious and aware of the necessity of technical education for refrigeration engineers, but New Zealand does not yet appear to have the same consciousness.

"Refrigeration Engineers in New Zealand were the means of 'produced income' for this country of up to 112 million pounds ($312 million dollars) last year. Most other branches of engineering for which education is provided are 'spending branches' more than 'gaining', yet we have the paradox of education being provided for the 'spenders' but not for the 'earners'. It should be the other way around to make good common sense".

It was interesting to note in Mr. Gichard's report that their society, considered a professional level group, has operative and service classifications of members. These memberships would correspond to NAPRE and RSES members in the United States. They have been active in obtaining recognition by registration or otherwise for these two groups, and recently obtained a limited electrical license in order that refrigeration personnel may perform certain electrical wiring and services incident to the refrigeration work.

Low-Temp Chamber For Testing Aircraft

TESTS on aircraft parts and assemblies under cold weather conditions simulating those encountered in jet plane flights to altitudes of 120,000 feet will be made in the new million-dollar altitude chamber under construction at the Douglas Aircraft Co., Tulsa, Oklahoma. Temperatures to 65 degrees below zero will be used in the tests.

The most modern setup of its kind in the nation, the altitude chamber will be 24 feet in diameter and located inside the south end of a flight hangar, with its accessory equipment, a 65-foot condenser tower, placed on the ramp east of the hangar. Massive shell for the chamber and its automatic control panel will be placed inside the hangar. The entire installation will cover an area equal to a half-city block.

The chamber will produce "ram" air (scooped up during flight for normal uses) as well as high pressure, high temperature air that comes from a jet engine operating at full capacity. Refrigerating is by three Worthington condensing units. One of the Worthington refrigeration compressors will be driven by a 75 hp motor, the other two by 15 hp motors.

Builders are Walco Engineering Co.; Engineers are Moffatt & Nichols, Los Angeles, Cal.

Prevent
COLD ROOM LOSS

with . . .

AIR-LEC DOOR OPERATORS

Air-Lec, shown installed above the cooler door, opens and closes the heaviest doors quickly, safely and smoothly at the touch of a switch or the light pull of a cord. Available with Mechanical Trip for one or two operating stations above each door approach, or with Electrical Switch for more and distant stations. Air-Lecs are in use in thousands of factories, food freezing and storage plants, meat packing companies, garages and service stations.

Speed and Safety are characteristic of Air-Lec because Air-Inertia-Spring, all elastic forces, are the patented forces used.

AIR-LEC FOR TYPICAL COOLER DOOR. . **$65.00**

. . . AND AIR SEAL

Installed at left of door in illustration, the Air Seal operates in conjunction with Air-Lec, to provide an absolute seal on cooler doors. Air Seal crowds the outer edge of the door to stop improper circulation and frosting. Air Seal is especially desirable where temperatures below freezing are maintained.

AIR-SEAL. $25.00

NOTE HOW THEY RE-ORDERED AIR-LECS

	Recently Ordered	Now Enjoy
Wayne Cold Storage Co., Inc. East Williamson, N. Y.	6	10
Calif. Ice & Cold Storage Co. San Diego, Calif.	6	14
Marhoefer Packing Co. Muncie, Indiana	1	9
Pan Am Foods, Inc. Brownsville, Texas	2	12

Fill in and return the coupon today for complete information.

SCHOELKOPF MFG. CO., Madison, Wis.

Cooler Doors are ___ Ft. Wide, ___ Ft. High. Air Pressure ___

Open Toward Warm Side, Cold Side.

Firm Name _____

Address _____

By _____

SCHOELKOPF MANUFACTURING CO.

312 N. THIRD ST., MADISON 4, WIS.

Air Conditioning For Atomic Storage

INDUSTRY and commerce are the vital front line defenses during wartime to maintain the armed forces in the field. The targets for an attack will be our industrial centers. Retaliation will be swift, but students of the problem have come to the conclusion that the difference between victory and defeat may depend upon the country that will be the first to resume production. Some believe that weeks or even days may be decisive in the war for survival and victory.

An important feature for quick rehabilitation of facilities is the preservation of vital company records, the duplication on microfilm or by other means, of documents and records necessary for the continuation of a business and their storage in safe repositories preferably out of the target areas. An unknown num-

Artist depicts layout of storage vaults at Iron Mountain. This former iron mine has been converted for the storage of valuable papers, key parts and other items. The vaults are air conditioned and dehumidified.

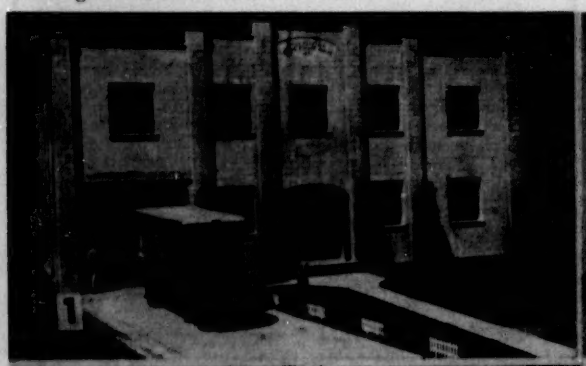


Fig. 1—Railway Express Truck backing into Iron Mountain's Receiving platform to make a delivery to the underground Atom-Proof Vaults.

Fig. 2—This 28-ton master vault door, actually heavier than the one protecting the Nation's gold at Fort Knox, guards the only entrance to the air conditioned and humidity-controlled private vaults.

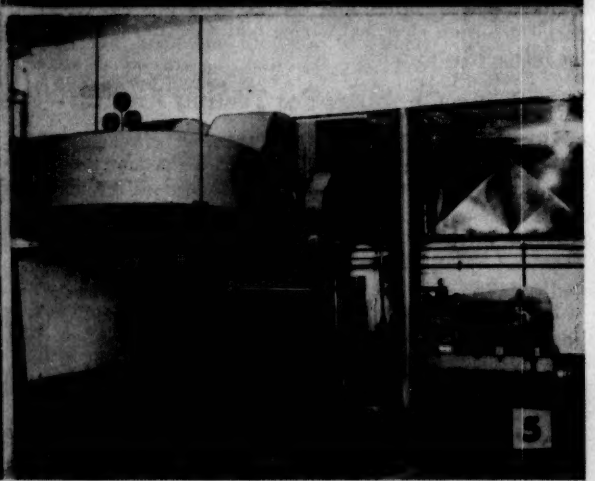


Fig. 3 and 4—Storage facilities and services to meet every need. In Fig. 3, a guard is placing a large file cabinet in one of the larger vaults; Fig. 4, guard makes a check of large vaults constructed in one of the inclined shafts.

Fig. 5—Installed in the machinery room is the air conditioning equipment. Outdoor air is delivered through combined heating and chilling unit into insulated duct work.

ber of such places have been selected and now hold valuable data in readiness against such a disaster. One of the unusual storage places available for use by the public is at the Iron Mountain Atomic Storage Vaults located near Hudson, New York (See photo display, Figs 1-5).

Facilities of this firm are available through Railway Express Agnecy offices throughout the nation, A. L. Hammell, president of the transportation company has announced. "The ready availability of a safe storage service, should not only afford some peace of mind about what to do on the part of the individual, but should help small and large businesses alike to take one of the major steps recommended by the government to prevent 'business amnesia' should disaster strike," Mr. Hammell said.

The storage by business firms of their vital financial records, blueprints, production processes, personnel records and engineering data has been urged by the Business and Defense Services Administration of the U.S.Department of Commerce as a key procedure in insuring the continuity or resumption of essential production after an enemy attack, he noted.

The blast-proof vaults at Iron Mountain have been constructed in the base of a mountain under a deposit of magnetite iron ore more than 100 feet thick. They occupy the tunnels of an iron mine which was the source of material for horseshoes and nails during the Revolutionary War. Business and personal papers, jewelry, paintings and other valuables to be preserved may be shipped to the vaults from offices of any Railway Express Agency.

Air conditioning and humidification system for the Iron Mountain Atomic storage was installed in 1951 by the Carrier Corporation, Syracuse, N.Y. to meet the following requirements: 70 degrees D.B.; 50 percent relative humidity when delivering 1000 cfm of outside air at 95 degrees D.B., 75 degrees W.B. (See Fig 5.). Equipment consists of "Weather Maker" unit with two multiblade centrifugal fans driven by a 5 hp single phase 220-volt motor, with "Aerofin" coil, 6-row direct expansion, filter section, by-pass and face dampers, and reheat coil. The fan delivers up to 5750 cfm against 2.5 inches static head. Machinery is V-belt driven condensing unit driven by a 7½ hp one-phase, 220-volt motor.

Tax Amortization

CERTIFICATES of necessity for accelerated tax amortization for 95 new or expanded facilities amounting to $70,348,267 were issued by the Office of Defense Mobilization in the two-week period from May 19 through June 1. Among these was a grant of $2,500,000 to The Santa Fe Railway Company for new refrigerator cars; and a grant of $800,000 to the Hartford Freezer Corp, East Hartford Conn. for a public refrigerated storage warehouse.

Railroads Deadhead Pallets

THE Interstate Commerce Commission has voted not to suspend railroad tariff provisions whereby railroads would make no charge for transportation of pallets, platforms, or skids used in connection with loaded movement of freight on all commodities from and to points in official territory. These provisions had been protested by the Central States Motor Freight Bureau Inc., which argued that if these provisions became effective, shippers would demand similar treatment from the motor carriers with the ultimate result of loss of much needed revenue for all concerned.

NEW

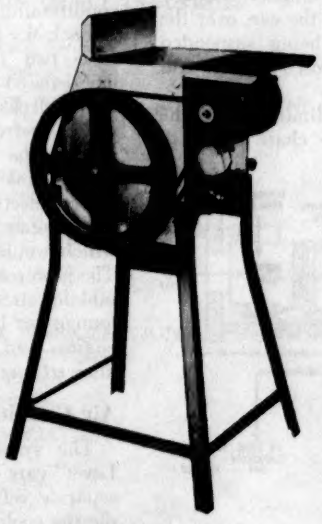
LOW COST ICE CRUSHER

ALL-STEEL CRUSHER FOR 25 LB. BLOCK ICE CRUSHER

. . . Ideal for Ice Stations—Vendors and Small Stores . . .

Grinds 25 lb. block in 25 seconds with grate closed.
Four grate adjustments give crushed ice from "pea-size" to 1½" chunks, by merely turning grate handle on side of hopper.
Galvanized for prevention of rust.
All-steel shell, legs and grate handle.
Belt driven, no gears, and self-aligning ball bearings.
Chute for filling containers.
Safety-shelf for block ice to be placed before entering crusher.
Guard covers flywheel, belt and motor pulley.
Only $125.00 with 1/3 HP motor.

Bateman 25 CROWN ICE CRUSHER



SEE YOUR DEALER

Bateman Ice Processing Equipment

MINERAL WELLS, TEXAS

Col-Flake ICE MAKERS

LIMITED TIME OFFER

Complete with F12 Refrigeration and electrical controls

Up to 1 ton $1,750.00
Up to 1½ tons 2,200.00
Up to 2 tons 2,550.00

Above prices are f.o.b. Chicago, complete installation data supplied. Storage bin not included. Bin prices upon request.

Buy direct and save.

COL-FLAKE CORP.
2446 S. Ashland Ave.
Chicago 8, Illinois

Please send further information.

Name .....
Address .....
City ..... Zone .... State .....
I require ..... tons of ice per day.

Dry-Operating Air Conditioning System Cuts Operating Costs for Passenger Trains

DEVELOPMENT of a compact, dry-operating air conditioning system for the Santa Fe Railway's new fleet of "Hi-Level" passenger trains was the newest industrial transportation development revealed by Santa Fe and The Trane Company of LaCrosse, Wis., about June 1. Officials of the two companies announced jointly that Santa Fe has ordered Trane's new equipment for the 47 cars in the five-train "Hi-Level" fleet now being built by the Budd Company for delivery in 1956.

H. Corbyn Rooks, Trane Vice-president and manager of heat transfer sales, and C. R. Tucker, Santa Fe Vice-president, said the new equipment will cut operating costs two ways. It eliminates water supply and service for the condensers — a key part of an air conditioning system — and takes less payload space.

Tucker noted the role of the equipment in Santa Fe's drive to boost economical travel by rail by increasing the comfort of passengers. The air conditioning will go into 35 chair cars, six diners, and six sky-dome lounge cars. Refrigeration capacity of the equipment in the cars would produce the equivalent of 20 tons of ice a day.

New fully air conditioned chair car under construction for Santa Fe, incorporates air condensing for twin compression-type refrigeration system.— Photo Courtesy of the Trane Co.

Supersensitive Response to Varied Weather

Travelers will have the luxury of super-sensitive air conditioning, the officials said, that automatically responds to the wide range of outdoor weather, from desert heat to freezing mountain cold, on a single run along the transcontinental route. Rigid service-testing for a year on two experimental "Hi-Level" chair cars on El Capitan and other trains proved the effectiveness of the new dry-operating air conditioning system, Rooks said.

Another feature that cuts operating costs, he added, is the compressor which saves on electric power, diesel fuel and compressor wear by automatic "unloading" or stepping down of its operation as cooling requirements drop. The air conditioning equipment fits in a compact compartment at each end of the car, over the wheels, instead of being suspended below the floor, exposed to dust and dirt.

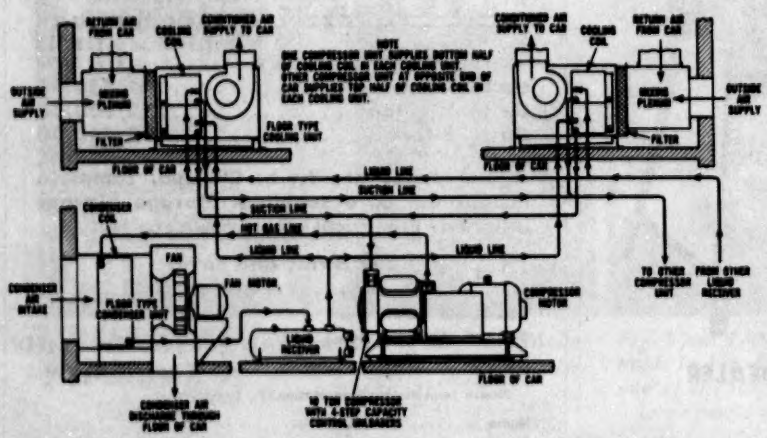
With vestibules eliminated on the passenger level, the chair cars will carry 28 more passengers than conventional cars. Center doors are located on both sides of the car, on the lower level. Baggage space and rest rooms off the vestibule are also air conditioned.

Diner Heat, Humidity Licked

Dining cars posed special air conditioning problems, with 80 diners occupying the entire upper level, and the all-electric kitchen, connected by elevator, situated below. The high heat and humidity from the kitchen and the large number of passengers will be handled by two 10-ton air conditioning systems.

Each sky lounge dome car also will have two 10-ton systems. A dome car seats 84 passengers on upper and lower decks, and includes a newsstand, refreshment bar, and rest rooms. The same twin air conditioning systems will serve each chair car.

The electricity demand on a new El Capitan diner is 120 kilowatts, which would light about 240 homes. The power source of each diner is two 60-kilowatt diesel engines. The dome lounge car has one 60-kilowatt diesel engine, and each chair car, one 40-kilowatt engine.


RETURN AIR FROM CAR
COOLING COIL
CONDITIONED AIR SUPPLY TO CAR
NOTE
ONE COMPRESSOR UNIT SUPPLIES BOTTOM HALF OF COOLING COIL IN EACH COOLING UNIT. OTHER COMPRESSOR UNIT AT OPPOSITE END OF CAR SUPPLIES TOP HALF OF COOLING COIL IN EACH COOLING UNIT.
OUTSIDE AIR SUPPLY
MIXING PLENUM
FILTER
FLOOR TYPE COOLING UNIT
FLOOR OF CAR
LIQUID LINE
SUCTION LINE
HOT GAS LINE
CONDENSER COIL
FAN
FAN MOTOR
CONDENSER AIR INTAKE
FLOOR TYPE CONDENSER UNIT
COMPRESSOR MOTOR
TO OTHER COMPRESSOR UNIT
FROM OTHER LIQUID RECEIVER
LIQUID RECEIVER
CONDENSER AIR DISCHARGE THROUGH FLOOR OF CAR
10 TON COMPRESSOR WITH 4-STEP CAPACITY CONTROL UNLOADERS

Schematic of refrigerant systems used in Santa Fe twin conditioning systems for chair, lounge, and dining cars. Dry condensing units are said to save on water storage space previously required, and also mount in car enclosure out of roadway dirt and nuisance.—Courtesy, Trane Co.

Air Conditioning Systems

The system design for the "Hi-Level" cars consist of two completely separate refrigeration plants to handle the cooling load at an outside design temperature of 100 degrees dry bulb and 80 degrees wet bulb. Each refrigeration system is composed of three parts: a cooling unit, a condenser and a compressor, one set of each of these components being located on opposite ends of each car.

(Continued on page 61)

Heating & Ventilating Exposition Changes Name

THE International Heating & Ventilating Exposition, also known as the Air Conditioning Exposition, has changed its name to International Heating & Air-Conditioning Exposition.

The 1957 exposition will be held at International Amphitheatre in Chicago where greatly expanded exhibit facilities are available, all on one floor. The dates are February 25 to March 1 inclusive. Management of the exposition continues under the direction of International Exposition Co., 480 Lexington Ave., New York.

City Products Earnings

NET EARNINGS of City Products Corp. for the first six months of 1955 were reported by Wm. J. Sinek, president as $1,522,005. This is equal to $1.21 a share, compared with $1.12 a share for the corresponding period in 1954. "There are indications," Mr. Sinek said, "that this improved trend may continue through the balance of the year. These improvements extend through practically every division of the company, so 1955 may show the highest earnings for some years."

COMING CONVENTIONS

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
October 14-15, 1955
Peabody Hotel, Memphis, Tenn.
KENNETH E. TROMBLEY, Director

FLORIDA ICE ASSOCIATION
October 9-11, 1955
Daytona Plaza Hotel, Daytona Beach, Fla.
MURIEL WASHBURN, Secretary

CANADIAN ASSOCIATION OF ICE INDUSTRIES
October 17-19, 1955
Guildwood Inn, Point Edward, Sarnia, Ont.
MILDRED E. CROFT, Exec.-Secy.

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS
November 8-10, 1955
Ambassador Hotel, Los Angeles, Calif.
J. RICHARD KELAHAN, Secretary

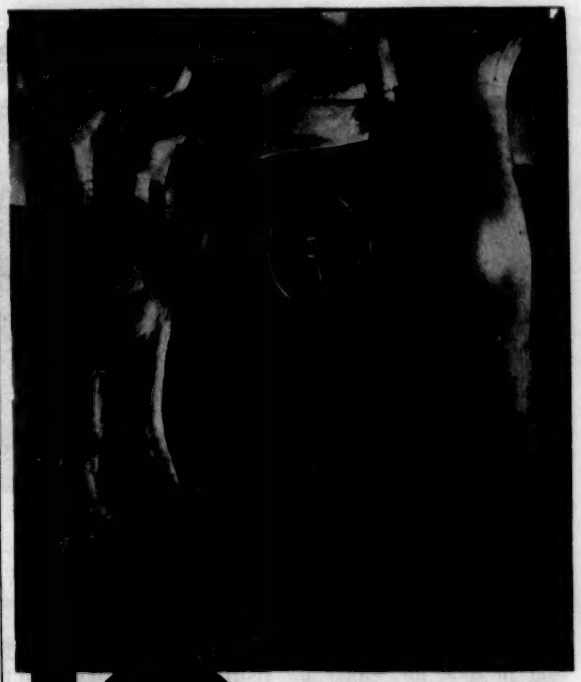
NATIONAL ASSOCIATION OF ICE INDUSTRIES
November 15-18, 1955
Biltmore Hotel, Los Angeles, Calif.
GUY W. JACOBS, Exec-Secy.

AIR CONDITIONING & REFRIGERATION EXPOSITION
November 28-December 1, 1955
Convention Hall, Atlantic City, N. J.
GEORGE MILLS, Show Director

DELTA STATES ICE ASSOCIATION
December 4-6, 1955
Buena Vista Hotel, Biloxi, Miss.
MRS. EDNA VAUGHAN, Secretary

SOUTHWESTERN ICE MANUFACTURERS ASSOCIATION
December 11-13, 1955
Gunter Hotel, San Antonio, Texas
P. A. WEATHERRED, Secretary-Counsel

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS
December 1-3, 1955
Traymore Hotel, Atlantic City, N. J.
R. C. Cross, Executive Secretary



GENUINE
OZITE
PIPE
COVERING
INSULATION

lasts a lifetime

Ozite is practically indestructible because it is made entirely of nature's most perfect insulant —hair. It applies easily and without waste . . . renders low conductivity for efficient heat barrier . . . allows close temperature control . . . cuts power consumption.

Write for Bulletin No. 300

NO SHAPE IS TOO COMPLEX

AMERICAN HAIR & FELT COMPANY
MERCHANDISE MART • CHICAGO 54, ILLINOIS

Charlotte Skating Rink Has Glass Floor

Construction view of floor in new skating rink of Charlotte Coliseum

FOAMGLAS is being installed under the skating rink of the Coliseum in Charlotte, N. C.'s, new Civic Center, scheduled for completion in time for winter ice sports. Said to be the world's largest dome, the huge building will seat 10,000 people around a 99 x 212 ft. arena. The rink area is 85 x 200 ft. The steel ribbed dome is 335 feet in diameter and its highest point is 113 feet above the floor. The floor has been designed to accommodate events ranging from ice hockey to basketball, auto shows and even a three-ring circus.

The heavy weight to be carried, influenced the choice of Foamglas cellular glass insulation which has a compressive strength over seven tons per square foot. Installation is pictured in the figure above. Insulation beneath the floor, enables quicker freezing of the rink surface and allows the use of less expensive refrigerating equipment. Aluminum foil is placed over the insulation and then seven inches of concrete wearing surface. Wrought iron pipes, which carry the brine coolant will be 2½ inches below the finished surface.

Refrigeration plant equipment consists of two Worthington compressors driven by direct coupled 125 hp electric motors, two 165 ton evaporative condensers, one 48-inch diameter x 14 ft. shell and tube brine cooler, two 450 gpm brine circulating pumps, and accessory items. Amreco, Inc., Minneapolis, was the rink contractor. The Coliseum was designed by A. G. Odell Jr. & Associates, Charlotte.

Indiana Ice Companies Protest Gross Income Tax

TWO major ice companies of Indiana, Polar Ice & Fuel Company, Indianapolis, and Ice Service Inc., Evansville, have initiated legal action to exempt ice sold in interstate commerce from gross income tax. A favorable decision would result in refunds to ice companies retroactive for three years.

Southwestern Ice Annual Convention Dec. 11-13

THE next Southwestern Ice Convention will be held in San Antonio, Texas, at the Gunter Hotel, beginning with the afternoon of Sunday, December 11 and will last through Tuesday, December 13. Return to December dates is being made because the February dates have proved unpopular, as shown by reduced attendance; that early spring dates are too far away from experience of the last season and too close to the on-coming season for the convention to give to members the benefit of the latest industry-wide experience in this changing ice business in time for sound planning for the year ahead.

The San Antonio meeting will be more of a conference than a convention. It will have a minimum of talks, maximum of grass roots experience and ideas in free-for-all business conferences. The theme of the convention will be based on the needs for trade and for earnings on investment. Questions of shifts in production, distribution, service, prices, that are needed to meet the radically changed conditions which every owner, executive and manager must face, will be answered.

California Farmers Build Freezing Plant

NINTEEN Southern California ranchers have formed an alliance in San Diego, California, to build a new $100,000 freezing plant, first of its kind in the state, the plant being ready now to begin operations. Specifically designed to process and freeze strawberries in order to maintain satisfactory prices throughout the year, the plant is attracting widespread interest in the western ranching regions.

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Merchants Refrigerating Erecting New Warehouse in St. Louis

CONSTRUCTION of a refrigerated warehouse has been started for the Merchants Refrigerating Co. on a 27-acre tract on the north side of Page boulevard, west of North and South road, in Vinita Park on the outskirts of St. Louis.

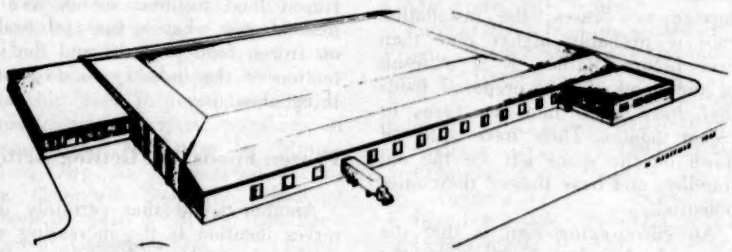
The structure, 430 by 260 feet, will contain approximately 1,300,000 cubic feet of refrigerated space with a temperature of 10 degrees below zero. There will be freezing tunnels where food can be frozen at 40 to 60 degrees below zero.

to process foods and freeze them in the tunnels.

A feature of the warehouse is the absence of columns within the building to expedite the handling and storage of merchandise. Platforms will be enclosed and merchandise will be unloaded from trucks directly into refrigerated areas.

Temperatures will be recorded on an automatic instrument and any temperature fluctuation can be detected and corrected immediately.

The Vinita Park site was selected



Sketch of new St. Louis Warehouse of Merchants Refrigerating Company

Particular emphasis has been placed on an efficient materials handling layout. All commodities will be handled to and from trucks and refrigerated cars on pallets. A system of pallet exchange will minimize handling and delay in loading and unloading trucks at the warehouse.

A separate building connecting to the warehouse and containing about 450,000 cubic feet of refrigerated space will be leased for the handling and distribution of frozen foods. Office space will be available on the second floor of this building overlooking Vinita Park. Space will be available to customers who may want

because of its size, which provides for future expansion. Page boulevard will be widened to a four-lane highway connecting with U.S. Highways 66 and 67 which bypass the city and will permit over-the-road trucks to load and unload without getting into congested areas.

The warehouse will be served by the Terminal Railroad Association.

The Merchants Refrigerating Co., a coast-to-coast firm, with nine other large refrigerated warehouses, celebrated its sixty-fifth anniversary last year.

The building was designed by the Fruin-Colnon Contracting Co.

Arthur N. Otis is president of the firm and Edwin M. Neylon, vice president and midwest territory manager. Locally, the firm is currently operating a refrigerated warehouse at Lewis and O'Fallon streets, which will continue to serve the downtown area.

ASRE Annual Meeting

THE 51st Annual Meeting of the American Society of Refrigerating Engineers will be held December 1-3 at the Traymore Hotel in Atlantic City, N.J. This meeting will be held in the same week as the ARI-sponsored 9th Exposition of the Air Conditioning and Refrigeration Industry which is November 28 to December 1 also in Atlantic City. Because both meetings are being held during the same week a record attendance is expected for both.

In addition to three technical conferences there will be a packaged air conditioner conference, a domestic refrigerator engineering conference and a conference on the effects of environment on domestic animals and plants. The General Technical Committee will sponsor six technical forums covering controversial and other timely Forum subjects which will be completely off-the-record and unrecorded open discussions.

Another major attraction of the Meeting will be the Research Exhibit which will present many of the most interesting research projects to the nation's top refrigeration and air conditioning executives, engineers, consultants and educators who usually gather at ASRE National Meetings.

Another highlight will be an open forum held by the Research Committee to discuss the possibility of ASRE accepting the subject "Research to Determine Standards for the Safe Limits of Contaminants Inside Refrigerant Systems" as a "Specific Research" project.

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Frozen Food Sales Show Continuing Increases

SAM VOGEL, PRESIDENT
National Frozen Food Distributors Assn.

FIRST-OF-THE-YEAR predictions that frozen food sales in 1955 would run over the $1½ billion mark seem to have been an understatement of the situation. At mid-year the evidence pointed to a sales volume somewhere between 15 and 20 percent ahead of a year ago, instead of the 10 to 15 percent gain expected earlier.

In this connection, our national association of frozen food wholesalers had occasion recently to poll its members as to how their sales were in the first half—up or down from last year. The results amazed me. More than 90 percent of these distributors replied that they were doing a better business than a year ago. The average increase in sales was 18.4 percent. The other 10 percent who suffered losses in volume, in almost every instance attributed these to special situations in their own shops, rather than to a declining demand for frozen foods.

For the past several years the frozen food industry has been turning in annual volume gains of 10 to 15 percent with unbroken regularity. Instead of the gain curve now showing a tendency to flatten out, as might be expected, the evidence this year is that it follows an opposite pattern. This is due mainly to the recent introduction of many *new* frozen foods, mainly of the heat-and-eat variety. The old stand-bys of the business — fruits, vegetables, juices, poultry and fish — have all shown sales buoyancy this year, but not to the extent that have some of the newer foods. An example of this is furnished by fish sticks, which were first introduced at the beginning of 1953. During the first six months of this year, sales of sticks were 34.5 million pounds, a gain of 54 percent over the 1954 first half. Although exact sales figures for other heat-and-eat items are lacking, most of these are believed to be running well ahead of the average gain for the industry as a whole.

Cabinet Space a Limiting Factor

But in spite of the first-half sales increases shown by most frozen food items, few executives in the industry believe that they are as large as they should have been — and would have been — if there had been adequate zero cabinet space in the nation's stores. That hurdle, and not the matter of public acceptance, has always been the limiting factor in the growth of the business. The fact that shelving for most other foods sold in retail food stores costs $1.00 a foot to install, but that frozen food cases cost $100 a foot, has created a very real, although constantly rising ceiling that limits the growth of the frozen food business.

Sometimes the ceiling seems lower than at other times. And the industry, at the moment, is passing through a growth phase in which it seems very low indeed. This is not because the retailers have stopped buying new cases; the installation rate is probably higher now than ever before. Rather, it is a result of the flood of new prepared foods that have gone into the cases in recent months. These have squeezed down on the space left for the old standbys and have limited their sales potential.

An encouraging sign is that the frozen food industry recognizes the situation and that something is being done about it. Two pilot promotion campaigns now underway in Dallas and Little Rock, Ark. are being watched with interest. These are group efforts — sparked interestingly enough by the local utilities — in which they, the retailers, the frozen food wholesalers and the home freezer dealers are taking liberal space in Monday and Tuesday newspapers, on radio and TV, to persuade home freezer owners to "stock your freezer on Tuesdays." The reasoning back of this is that if some of the frozen food buying, now largely concentrated in the last two days of the week, can be diverted back to Tuesdays, the week-end strain on the cabinets will be relieved and the effective ceiling on sales will be raised somewhat. If successful in those two cities, many similar campaigns are expected to start elsewhere this coming winter.

The frozen fruit and vegetable packers are obviously concerned over the congestion in the cases and, through their national association, have also dealt themselves a hand in this popular new break-the-cabinet-bottleneck game. A fund of several hundred thousand dollars is being collected to finance a research program which will have as its goal the development of a practical, multi-level display cabinet. This is badly needed because the limiting factor in expansion of the frozen food department in many of the smaller stores is floor space. In such stores there's no more room for the department to grow sidewise; from now on the department must grow *up*. While this long-range program is underway, the packers are seeking accurate cost-movement-margin figures (something long needed by the industry) which are expected to prove to the retailer that existing cabinets, priced at $100 a foot, really are bargains, when the profit potential of the business is taken into consideration.

When all of these efforts are added up, they spell something new in the frozen food business — an awareness of just what is the real brake on frozen food progress and the intention of the industry to do something about it.

Frozen Foods Are Getting Better

Another trend that certainly deserves mention is the increasing attention the packers are giving to the quality of their products. In the past this has been a problem in some few branches of the business, but not, it must be added, in all of them. For example, the fruits, vegetables and juices have been packed for years under voluntary grading standards administered by the Department of Agriculture and these products are unanimously regarded in the industry as being of the highest quality.

But elsewhere the pack is not supervised, or is only partly so, and there have been some complaints of quality lapses. The encouraging thing to be noted about this situation is that the packers are now moving to correct it. Several recent actions may be cited as examples. The fish stick packers have, in cooperation with the U.S. Fish & Wildlife Service, written a set of grading standards for that product, similar in general provisions to those now in effect for the fruits and vegetables. A grading service to implement them will be set up soon; it will be administered by Fish & Wildlife Service. Grading standards for other sea food items are being studied, and the industry may have these soon for breaded shrimp and some of the fillets.

Still another move towards quality control has been undertaken by the packers of chicken and turkey pot pies. The packers of these have held informal meetings; the next step, it

is understood, will be to petition the Food & Drug Administration to specify a minimum fill of meat, below which a pot pie may not go and still merit being called such. FDA has the authority to do this under legislation which permits it to specify the "identity" of a product.

All of these efforts are straws in the wind, pointing to the time when all frozen foods will be packed against recognized quality "measuring sticks". To most executives in the industry, this time cannot come too soon. They feel that the industry was built to its present position by the "quality story", as much as by any other means, and that the formula shouldn't be changed.

More Frozen Food Mergers?

Frozen foods are getting to be Big Business. And this, as might be expected, has been reflected in the merger rate. There have been several big ones in recent months — most importantly the purchase of Snow Crop Marketers by Minute Maid Corp., C. A. Swanson & Sons by Campbell Soup Co., Holiday Foods by Swift & Co. and Mrs. Lee's Pies by Carnation Co.

Even more are expected, as a matter of course, because of the interest that food processors in other lines have shown in the frozen food business. Their desire to get into that business — preferably by the merger route — seems to be a pressing one due to the increasing importance of the frozen food department in the retail food store. One of the grocery trade papers, Chain Store Age, recently compiled a comparison of the relative importance of the various departments in the typical chain grocery store. The latest figures, for 1954, showed frozen foods in 5th place, topped only by meat, produce, tobacco products and bread. The interesting thing to note, however, is that in one year's time, from 1953 to 1954, frozen foods had improved its position by moving up from 7th to 5th place. Here are the Chain Store Age figures:

Comparative Standings, Using Produce Dollar Sales as Par (Index base of 100)

	1953	1954
1. Meat	213.6	228.2
2. Produce	100.0	100.0
3. Cigarettes & Tobacco	39.1	37.9
4. Bread & Cakes	37.3	36.0
5. Detergents & Soap	32.7	31.4
6. Coffee	31.8	35.1
7. FROZEN FOODS	28.2	35.1
8. Canned Vegetables	26.4	25.9

Few in the industry expect frozen foods to stay at that level. Further sales gains in the last half of 1955 may even guarantee a third-place ranking this year, and certainly by 1956.

Ownership of Ice Vendors

AN IMPORTANT percentage of those who purchase and operate ice vending stations are not ice manufacturers, according to a tabulation issued by the National Association of Ice Industries. The following percentages apply to type of owner, not to number of stations:

Ice Manufacturers	43.0%
Ice Dealers	16.4%
Liquor, Beer & Beverage	17.2%
Frozen Food Locker Plants	4.7%
Boat & Marine Bases	4.7%
Gas Stations	3.1%
Dairies	3.1%
Bait & Tackle Shops, Coal & Lumber Yards, Roadside Markets, Junk Yards, Real Estate Companies, Restaurants, Parking Lots, Farmers	7.8%

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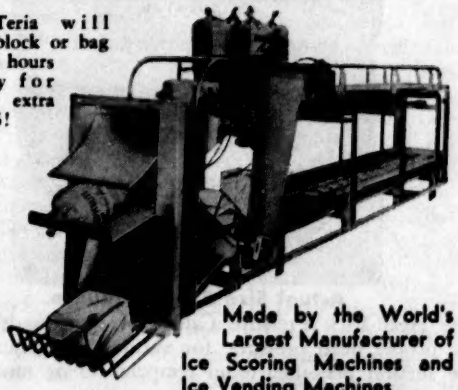
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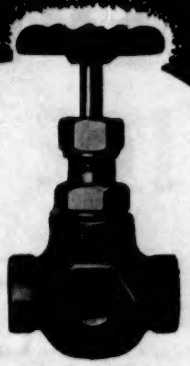
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Service Station Provides Forum For Talk on Safety

WHILE enroute from Dallas to Paris, Texas, recently Bill Leonard, director of safety and insurance for The Southland Corporation, Dallas, Texas, pulled into a service station to fill his car with gas and to check the oil. While the attendant was checking the gas and oil, Bill unloaded his safety charts and easel, set up the equipment in the station driveway, and held a traffic safety meeting, promoting a "slow down and live", and July 4 weekend safe driving program.

W. F. Leonard Conducts safety meeting at a roadside gasoline station.

It took four minutes to unload and load the equipment back into his car. The safety talk took six minutes, discussing the tragic toll statistics of vehicle accidents, and throwing out a few cautions for July 4th holiday driving. The talk was climaxed by a one-minute showing of this chart in the picture —

SAFETY IS EVERYBODY'S BUSINESS 24-HOURS A DAY.

Five customers at the service station and the cameraman attended this meeting. That's not many people, only six, but all were preparing to sail off down the highway to a Happy 4th of July holiday and all of them were of the opinion that Safety is not publicized enough to the general public to curb the general "Don't Care" attitudes. And Bill will bet eleven of his minutes on it any time. It might help someone — (Safety is just "people helping people," he says.)

In looking at the tragic toll statistics vehicle accidents, holiday weekends, it would indicate someone should spend many minutes on this work.

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Truck-Trailer Makers Plan Special Study of Refrigeration Problems

A SESSION of the Refrigeration Committee of the Truck-trailer Manufactures Association held in Detroit, July 21 resulted in assignment to manufacturer-experts of three major subjects for special study and definitive reports at the association's annual convention to be held in January in the Edgewater Gulf Hotel, Edgewater, Miss. The session was a part of the TTMA's seventh annual summer membership meeting in the Sheraton-Cadillac Hotel. It was open to all members and drew attendance of many besides committeemen.

Presiding was L. H. Magor, president, Aluminum Body Corp., Montebello, Calif. After hearing discussion, Mr. Magor by agreement with discussion participants directed studies and reports as follows:

Development of a recommended standard method of rating the various types of refrigerating systems used in truck-trailers; assigned to M. B. Green, Vice President, U. S. Thermo Control Co., Minneapolis.

Truck-trailer insulation; assigned to G. P. Oldham, general sales manager, Gustin-Bacon Manufacturing Co., Kansas City.

Refrigerator trailer performance and desirable characteristics; assigned to Harold Johnson, transport and marketing specialist conducting tests for the U. S. Department of Agriculture, Washington.

Discussion brought out that one of the most frequent questions asked by operators of truck-trailers transporting perishables is this: What does a specific amount of refrigeration cost me? Mr. Magor stressed that there should be a specific, reliable answer based on standards such as the Society of Automotive Engineers has developed in many other fields. It was pointed out in roundtable remarks that manufacturer tests may consistently show certain results with certain systems but that when the truck operator is performing in actual commercial transportation he may get an entirely different set of results, depending on type of operation, maintenance, skill of employees, length of service, and severity of demand. A definite rating, stated in terms of output at the cargo point and the conditions pertaining to the rating, was seen as a cure to the difficulties of reliable figuring of refrigeration costs.

An unanswered question was how much return duct area should be provided to assure adequate circulation of the cooled air in a "reefer." It appeared that progress is being made in duct development, especially as to floor duct-boards and aluminum floor racks. One rack was described as weighing only 230 pounds but testing out successfully with loads of as much as 30,000 pounds. Adequate air circulation of cooled air around loads, including the area beneath the loads, long has been declared to be one of the keys to successful transportation of perishables requiring refrigeration.

Briefly discussed were the potentials of a "driven" axle on "reefer" trailers as a means of powering mechanical cooling systems. It was conceded that such a drive would be feasible only on long runs where continuous power would be derived, but reduction of mechanical troubles by such an arrangement was envisioned.

Charles Hoffman, speaking for the Equipment and Maintenance Section of American Trucking Associations, Washington, reported that frozen foods interests and operators of refrigerator trailers have requested that a project be undertaken in their behalf. If such a project is begun, he said, the trailer manufacturers doubtless will be called upon to contribute their knowledge. He was assured aid would be given.

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"AFTER" photo, same room, modernized with KRAMER Ammonia THERMOBANK at minus 25° F; 6400 gallons hardened daily.

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Wrapping Materials for Frozen Fish

By MARTIN HEERDT, JR.
Chemist Fishery Technological Laboratory
Seattle, Wash.

MANY wrapping materials that are completely satisfactory in preventing desiccation of frozen fish products during storage do not furnish acceptable resistance to the penetration of air from the outside. Atmospheric oxygen causes the loss of fresh flavor, the development of rancidity, the bleaching or fading of natural color, and the development of colors foreign to the fish. To minimize these deleterious effects, contact with oxygen must be avoided; for even the amount of air often inadvertently included at the time of packaging contains enough oxygen to start these oxidative changes.

Experiments in progress at the Seattle Laboratory of the Fish and Wildlife Service strikingly demonstrate the inadequacy of ordinary moisture-vapor proof films in keeping air away from frozen fish fillets and steaks that have been wrapped according to present practice. Two methods were employed in packaging duplicate lots of fish. The first, or conventional method, consisted of wrapping the fillets or steaks in moisture-vapor resistant film. The second consisted of vacuum packing the fillets in hermetically sealed tin cans. After being rapidly frozen and subsequently placed in cold-storage for several months, the fish that had been vacuumized and hermetically sealed in tin were in the same condition as at the time of packing, while the samples that had been wrapped in moisture-vapor proof paper were lacking in flavor, faded, discolored, and partially rancid.

With many species a tremendous decrease in quality occurred in the wrapped samples, in some cases rendering them completely inedible, in contrast to the fresh, unchanged condition of the duplicate samples packed in evacuated tins.

These results should not be interpreted as a recommendation for the use of evacuated tin containers in the storage of frozen fish. Although such a packaging method would undoubtedly keep fish in an excellent condition over a long period of time, there is danger that if frozen fish were packed in ordinary tin cans, consumers or dealers might store the cans at room temperatures regardless of any printed cautions. Under such conditions, frozen foods would defrost and spoil rapidly; and when hermetically sealed, defrosted canned foods possess all of the requirements for the growth of *Clostridium botulinum* with consequent toxin production. The findings should serve to emphasize the importance of the selection of packages, films, or wraps that are not only moisture and vapor proof but that also resist atmospheric oxygen.

The Storage and Handling of Semi-Perishable Foods

THE proceedings of a symposium on "Establishing Optimum Conditions for Storage and Handling of Semi-perishable Subsistence Items" have been issued by the Quartermaster Food and Container Institute for the Armed Forces, 1819 West Pershing Road, Chicago 9, Ill. Copies are being distributed without charge to those who are concerned with research in this field.

Among the subjects discussed are storage and transportation and effect of atmospheric changes on packaged rations, and the economics of cold storage of field rations compared with dry storage. Among the contributors were: D. K. Tressler, Quartermaster Food and Container Institute for the Armed Forces; J. G. Woodroof, Georgia Agricultural Experiment Station; H. C. Diehl, The Refrigeration Research Foundation; Carl Kayan, Columbia University; E. K. Heaton, Georgia Agricultural Experiment Station; Vallee O. Appel, Office of The Quartermaster General.

Air Conditioning For Poultry Flocks

POULTRY flocks raised in air conditioned rooms were shown to the public August 3 during the annual Farm Field Day at the Agricultural Research Substation of The University of Delaware. Four rooms of broilers are under test at the Substation to determine the best temperature and humidity for raising broilers most economically. The four rooms are sealed and insulated. Temperature can be set at any level between 60 and 90 F. Humidity can be controlled anywhere from 40 to 100 percent. Artificial lights are the only light source. A fifth room raises birds under regular conditions as a "control room" for comparison. By the use of these rooms it is hoped to learn the ideal conditions for raising broilers to maximum weight with minimum feed consumption, says Dr. E. F. Waller, chairman of the department of animal and poultry industry at the University of Delaware.

The five rooms are 12 x 12 ft with 150 chicks in each room. The chicks are all started under the same conditions in batteries or flow pens. They are moved to the experimental rooms at four weeks of age. All chicks are fed the same ration throughout the growing period and all rooms are equipped with automatic waterers. Recording instruments keep a continuous record of humidity and temperature. Periodic chemical analysis checks the amount of ammonia in the air. This research is part of a regional project in poultry housing in cooperation with the 13 northeastern states.

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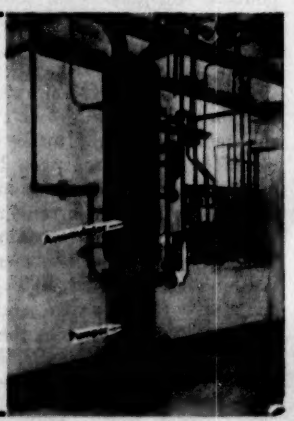


New Frozen Food Container

(Continued from page 2)

The super-chill container was designed by Willard L. Morrison, frozen food freezer pioneer, to carry food to refrigerated warehouses or direct to retailers without transfers between trains and trucks. Such transfers often thaw foods, causing damage.

Built at Alcoa's New Kensington (Pa.) works, the container used in the current test is 7 ft. 1 inch square and 7 ft. 6 inch high. It has an aluminum liner, six inches of insulation and an aluminum outer jacket. According to Morrison, who was retained by Chicago's Union Stockyards Reseach Div. for this development, liquid nitrogen is used in the shipping container as it has proven to be the least expensive refrigerating media. Tom Wildish of Linde Air Products Co. collaborated in the engineering of the project.

When food arrives it is still so cold (0 F or below) that it can be handled for a reasonable period at room temperature. Ordinary shipping methods sometimes allow foods to reach temperatures as high as 20 F. The "super-chill" container requires no space for refrigeration equipment or for the salted ice that is the standard refrigerant used in railroad cars. Foods are loaded at room temperatures and frozen in the container, thus keeping workers out of the cold areas.

Like most important developments, the "super-chill" container has had careful laboratory testing before being put into practical use. The Venezuelan guarantee of performance was made by Libby, McNeill & Libby, which has been working on the new shipping container for more than four years. Tests show that cartons similar to the one being shipped to Venezuela can go unrefrigerated for 40 to 41 days before the temperature goes up from minus 150 F to zero. The trip from Chicago to South American retailer is 17 days.

One test container built to hold ten tons of frozen food was loaded, super-chilled to minus 150 deg. F and subjected to a draft of heated air. Under these conditions, 52 days elapsed before any part of the contents reached 0 deg. Another interesting trial of the super-chill process involved the shipment of 200 pounds of frozen steaks to U.S. Ambassador to Russia, Charles E. Bohlen. They were used to feed contestants in Olympic speed skating competition in Moscow.

"This development promises to open up a broad new market for us overseas," says W. G. Mitchell, Libby vice-president in charge of frozen foods. "The prospects in domestic frozen food shipping are even more encouraging," he added. Libby officials, also envision application of the new principle to domestic frozen food shipments, where shipping time is not as great as in the export market, by bringing the temperature down to about 50 or 80 degrees below zero. "We may build a few vans for experiments, but we have no intention of invading the refrigerated shipping business, leaving that to the established refrigerator car concerns," Mr. Mitchell said.

Michigan Cold Storage

(Continued from page 23)

plant when it is in full operation, and they will be under the supervision of M. S. "Chief" Fuller, of Sodus. Fuller is the secretary-manager for the firm and is well known through the section of the fruit belt as a former farm appraiser for the Farm Credit Administration.

Directors of the corporation in addition to Carl Steimle, president, are Victor Crandall (Sodus), vice-president; Harry Hogue (Eau Claire), treasurer; Russell Tidey (Sodus) and Forest Steimle (Indian Lake), directors. Steimle estimated the initial investment of approximately $800,000 in the first section. It is hoped that construction of the second section will be completed early next year, bringing the capacity up to 30,000,000 lbs. of frozen products and 200,000 bushels of fresh fruit storage.

Air Conditioning System Cuts Operating Costs

(Continued from page 52)

Compressor used on the cars is a nominal 10-ton compressor equipped with a 4-step capacity control unloading system to handle the varying load conditions in the cars. Capacity of the system is such that it can handle the peak cooling load requirement under maximum operating conditions without the use of water spray over the condenser coil.

This condenser design eliminates the need for adding additional water storage on the car to handle the condensing load. Further, since the unit is composed of only a coil and fan, service and maintenance requirements are cut to a minimum to the elimination of a spray water system, water tanks and pumps.

The cooling units located in the equipment area of the car are also split so that each compressor handles ½ of each cooling unit. In this way, in the event of the failure of one refrigeration system, the remaining unit in operation could supply ½ cooling capacity through the entire car. The air distribution system is so arranged that each cooling unit handles ½ the total load requirements.

New Toronto Warehouse Opened

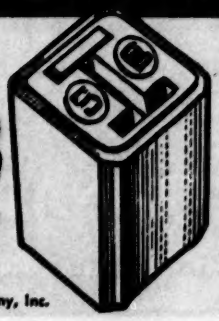
THE NEW Ayer Storage Ltd. refrigerated warehouse on the Queensway was officially opened at Toronto, Canada, with capacity of 40,000,000 pounds of food. Processing, growing and trucking interests toured the reinforced steel and concrete building, the first refrigerated warehouse to be built in the Toronto area in 27 years. The plant provides 1,700,000 cubic feet of refrigerated space and is the most modern in Canada.

No Clog! No Fog! No Bogging Down! SELF-TENDING!

STERLING

* KOOLER KUBES

Save Work...Time...Trouble...Money!



*Trademark International Salt Company, Inc.

In Unit Coolers, Brine Spray Cold Diffusers, or Spray Deck Systems!

Heavily compressed 50-lb. refrigeration cubes . . . dissolve evenly . . . strengthen brine continuously and uniformly . . . eliminate labor, guesswork and waste in the handling and measuring of loose salt.

Always uniform. Constant Salometer strength reduces product shrinkage . . . icing of coils. Clean brine prevents clogging of spray nozzles . . . chill-room fog. Less salt . . . less work . . . better results all around!

Try Sterling KOOLER KUBES Today! Or, for information, write

INTERNATIONAL SALT COMPANY, INC.
Scranton 2, Pa.

News of People

JAMES C. IRWIN, vice president in charge of engineering of the United States Cold Storage Corporation, will attend the Ninth Congress of the International Institute of Refrigeration in Paris, August 30 through September 7. This meeting will bring together representatives of all phases of refrigeration throughout the world. The program will cover various aspects of refrigeration from the highly theoretical to practical application to food processing, transportation, warehouse construction and operation.

Mr. Irwin, who will represent the National Association of Refrigerated Warehouses, has been asked to discuss refrigerated warehouse construction.

HAROLD G. HACKLE, assistant to the president of the Union Ice Company, San Francisco, has been re-elected president of the Frozen Foods Distributors Association of California, Inc. Ted Faurres, A. Levy & J. Zentner Company, San Francisco, was named new secretary-treasurer.

DEATHS

Harry S. Ricks

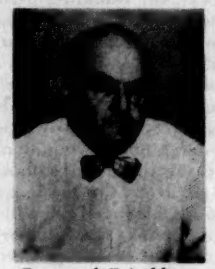
THE death of Harry S. Ricks, secretary and general manager of the Kern Ice and Cold Storage Company, Bakersfield, Calif. occurred July 15 at a local hospital. Mr. Ricks, active in the cold storage business for 31 years, had been chief engineer at the Bakersfield Ice and Cold Storage Company from 1924 to 1945 when he took over management of Kern Ice and Cold Storage. Surviving are his widow, Lucy; a son, Barlow Seeley; a daughter, Mrs. Sammie Lou Woolley of Menlo Park, Calif.

Lewis Harvey Davis

THE death of Lewis Harvey Davis, Miami, Florida, formerly of Birmingham, Alabama, occurred July 28. Mr. Davis owned and operated the Home Ice Company in Miami from 1940 until 1952 and at one time operated a chain of ice plants in Georgia, Florida, Mississippi and North Carolina. He was a Mason and a Shriner. He was 80 years old.

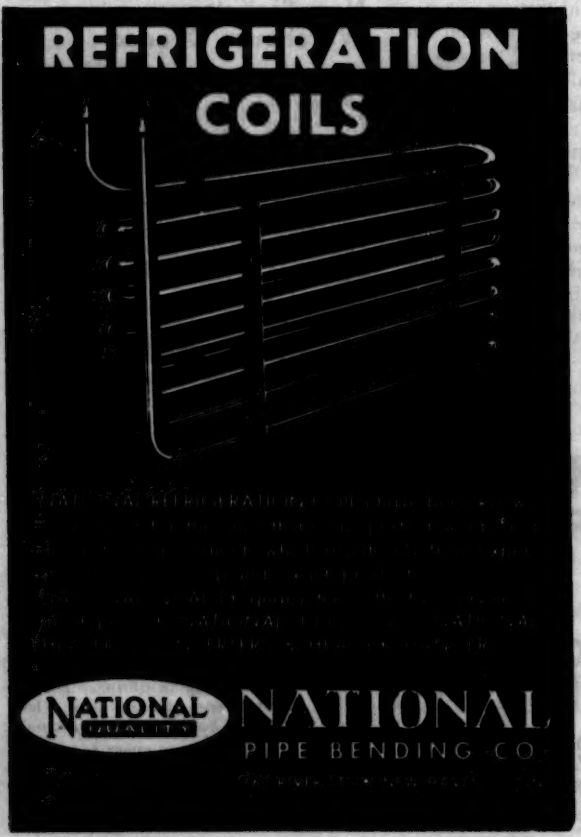
Raymond Frischhertz

LOUISIANA Chapter was saddened by the death of Raymond Frischhertz, Sr., on June 8, 1955. Mr. Frischhertz was active in the affairs of the chapter for many years. During this time he served on various committees. His assistance on the Publicity Committee was outstanding. Mr. Frischhertz was chief engineer



Raymond Frischhertz

and building superintendent for the Times-Picayune Company. He was a native of New Orleans, attended public schools, completed studies of electrical engineering at Tulane University. In addition to his membership in NAPRE he was a member of American Institute of Electrical Engineers, Illuminating Engineers Society and Young Men's Business Club.



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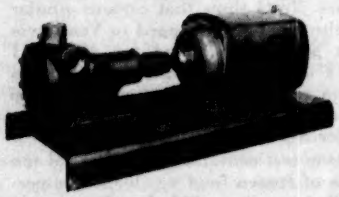
REX LIQUID RETURN PUMP



One Model — Takes Care of Any Refrigeration Plant Regardless of Size

Less Than ¼ Cost of Other Types

This pump will take care of the slop-over and protect the first stage compressors in any refrigeration plant—regardless of capacity in tonnage. Excellent inlet characteristics with a minimum of drop—no cause for turbulance—and ability to handle pockets of vapor.

Capacity is 5 to 15 GPM for return systems that generally operate on a gauge pressure of —10" vacuum to 165 p.s.i.

For recirculating ammonia, it will handle 25 GPM for pressures —10" vacuum to 15 to 20 p.s.i.

Low in cost. Proved in many installations. Unique—rugged design. Trouble-free operation.

GET THE FACTS — WRITE.

REX ENGINEERING & SALES CO.
Oklahoma City, Oklahoma
BOX 5141
REX

L. R. Graves

SEATTLE Chapter, NAPRE, lost a substantial supportor in the death of L. R. Graves of Northwest Baker Company, of which he was chief refrigeration engineer. He died of a heart attack at the age of 65. Mr. Graves was born in Spokane, Wash., and was a World War I veteran, and a mechanical engineering graduate of Washington State College. He spent three years in Waynesboro, Pa., for Frick Company and later represented the firm in Seattle. He joined the firm with which he was affiliated at the time of his decease.

Wilbur C. Roberts

DEATH took Wilbur C. "Bob" Roberts, past president, California Chapter No. 1 NAPRE, on July 16, 1955. This popular member of San Francisco chapter entered the refrigeration game in 1927, installing plants for Fairbanks Morse Co., until 1942 when he became a mechanical engineer for the U. S. Army, installing cold storage facilities at Camp Cook and the Army cold storage plant (Mission Bay) of San Francisco. He was the chief operating engineer when the Mission Bay plant was moved to the Alameda Army Medical Depot in 1950, where it became one of the largest cold storage facilities in the armed services.

Votow Harrison

VOTOW HARRISON, former national director NAPRE, and long time resident of Port Arthur, Texas, died of cancer early in June, 1955. Mr. Harrison was refrigeration engineer with the lubricating department of the Gulf Oil Company Refinery at Port Arthur. He was a member of NAPRE for 23 years and served on its national board

Votow Harrison

for several terms. He was a World War I veteran, member of the Methodist church and active in Masonic circles.

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PIPE COILS—FIN COILS

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Rempe Coils are accepted in the industry as quality equipment that is built for long service without maintenance. Rempe Coils are used on the most difficult jobs and forgotten. This confidence has been earned the hard way—through proper engineering, good quality materials and precision manufacturing.

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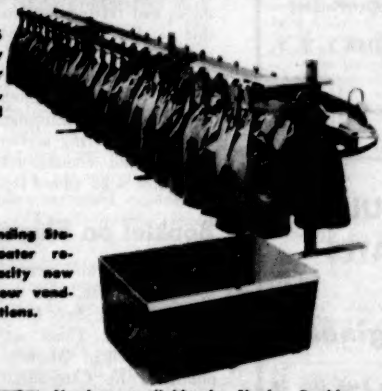
The cost is greater . . . when you do it later. NOW is the time to let us design your vending installation.

The new S & S Duo-Rail greatly reduces vendor installation costs, simple to install and operate.



New S & S Vending Stations with greater refrigeration capacity now available for your vending station locations.

Improved Perfection Vendors available in Single, Double and Triple Deck units for vending combinations of bag and block ice.

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AUTOMATIC ICE VENDORS

• Shipped ready to work for you.

REFRIGERATION ENGINEERING COMPANY

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CATALOGS AND BULLETINS

New Guide For Industrial Sealants

A NEW reference guide and chart explaining the multiple uses of special chemical sealants in a variety of industrial, manufacturing, processing, agricultural and maintenance operations has been published by the industrial division of Permatex Company, Inc., pioneers in the development and volume production of scientifically formulated sealing compounds for automotive, aviation, marine and industrial use.

The new guide describes the proper sealants for use in hundreds of industrial applications, including industrial refrigeration, plumbing and heating, exposed and underground pipe lines and tanks, machine tooling equipment, oxygen assemblies and all mechanical and industrial equipment requiring leak-proof air, water and vapor and chemical connections. Also included are descriptions of sealants exceptionally resistant to vibration, resistant to hot and cold acids, alkali and salt solutions and to coolant chemicals.

In announcing the new guide, specially designed to help solve industrial sealing problems, C. A. Benoit, Jr., president of Permatex, pointed out that failure to use proper and effective sealants to prevent leakage and seepage costs industry more than a billion dollars a year.

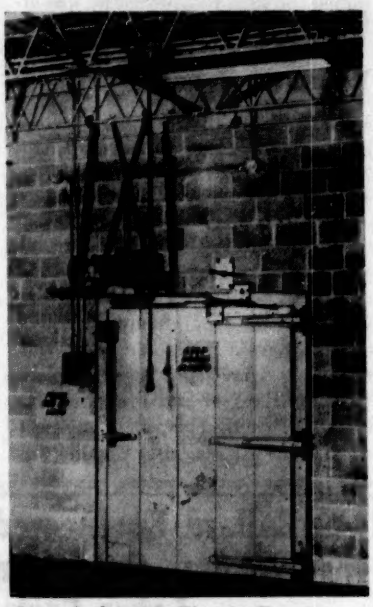
Folder on Propylene Glycol

EIGHT easy-to-read charts showing physical properties of interest to users of propylene glycol are contained in a new 16-page data folder released by Carbide and Carbon Chemicals Co., Div., of Union Carbide and Carbon Corp. The folder also presents data on physiological properties, specifications, shipping containers, constant-boiling mixtures, solubilities, and applications.

Propylene glycol is an important raw material for polyester resins used in reinforced plastics; an intermediate for plasticizers; and a solvent and humectant widely used in foods, cosmetics, and pharmaceuticals. This glycol is an antifreeze in sprinkler systems and refrigeration systems; a lubricant for machinery used in packaging foodstuffs, pharmaceuticals, and beverages; and a component of hydraulic fluids. Copies of this new data folder (F-8738) are available on request.

Catalog on Electric Refrigerator Door Units

ELECTRIC Doorman refrigerator door units provide smooth, fast open and close, plus a tight seal held rigidly against jamb. This unit is non-violent and will not jar or put excessive pressures on doors. Complete specifications, applications and information on folding, swinging, sliding, overhead and craneway door operators are available in a new bulletin-catalog entitled, "Electric Doorman", issued by the Electric Power Door Company, Inc., Minneapolis, Minn.



One of the new Electric Doorman refrigerator door units

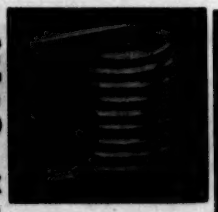
Photographically illustrated with actual installations of warehouse doors, electric eye special problem doors and controls, hangar doors, hospital operating room doors and refrigerator door operators, etc., this catalog also includes blueprints, erection diagrams, selection tables and construction features along with necessary hardware and recommended control systems. Complete information on the company's engineering service available to industrial and commercial users of doors and gates is an added feature.

Booklet on Electric Sets

COMPACT and versatile, the new line of small size, high capacity Caterpillar Diesel Electric Sets brings a new concept in generators. These major developments are described in "Modern Electric Power," published by Caterpillar Tractor Co. In four illustrated pages, this booklet describes the advantages of these rugged sets, matched to their Cat Engines to provide maximum efficiency.

Copies of this booklet, form 31649, can be obtained from any Caterpillar Dealer or by writing Caterpillar Tractor Co., Peoria, Ill.

PIPE BENDS & COILS



The "know-how" of nearly 40 years of specialization in pipe fabrication back every job produced by our master metalworkers. You can confidently entrust your work to us. . . even stainless steel, or up to 6-inch extra heavy. Complete welding facilities.

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Duraface Foamglas Block

A FOUR-PAGE folder describing the recently introduced Duraface Foamglas is now available from the Pittsburgh Corning Corporation. Duraface Foamglas is a new material which combines insulation and integral finish in a single block. The hard white crust is fused to one surface of the block during the manufacturing process. The new product makes possible the construction of an insulated and finished wall in one operation. The folder describes the manufacturing process, lists physical properties and details the sizes available.

New Booklet on Electrical Components

A NEW 42-page booklet designed as a help in selecting electrical components for air conditioning, heating, ventilating, pump and compressor equipment has been issued by Cutler-Hammer Inc. pioneer manufacturers of electrical equipment. The increasing inter-relation in this class of equipment has made the job of specifying motor control a complex operation. The profusely illustrated booklet covers all the fields, making the job of specifying much easier because it gives all the motor control data needed.

Allin Liquid Eye Indicators Approved by UL

APPROVAL of the 100 and 200 Series Liquid Eye indicators by the Underwriters' Laboratories is announced by Allin Mfg. Co., Chicago.

"More and more manufacturers are stressing safety in their product. This leads to submitting their product to UL for approval. We also realize the importance of safety", says Albert Wittlin, President of Allin, "and we believe manufacturers will appreciate this step toward assuring the manufacturers that our Liquid Eye will withstand rigid and exacting tests."

No basic design change was made in the 100 and 200 Series Liquid Eyes to meet with UL approval. However, one important change in material was made over one year ago. This pertains to the exclusive use of Teflon as the gasket material. The use of Teflon removes all possibility of gasket failure where extreme pressures and temperatures may prevail; such as, in automobile air conditioning systems.

UL approved models are available in ¼, ⅜, ½, and ⅝ inch male to male flare, male to female flare, or sweat end connections. Copper tube extensions on the sweat type permit soldering or silver-brazing into the line without taking the Liquid Eye apart.

All Liquid Eye indicators are factory tested for leaks to assure a perfectly tight assembly when installed.

MANUFACTURERS' NEWS

Refrigerant Chemicals In Good Supply

FOR THE first summer in several years, fluorinated hydrocarbon refrigerants and aerosol propellants of every type and class are in good supply with productive capacity geared to meet current and long-term needs of refrigeration, air conditioning, aerosol and other consuming industries. The shortage of some products experienced this time last year are definitely over, and no one need do without, whether he is a cosmetic manufacturer contemplating a new personal product in aerosol form, or an air conditioning contractor requiring a refrigerant to charge a new installation.

This reassuring news concerning the gases which are the heart of all aerosols and air conditioning and refrigeration equipment, became evident as General Chemical Division, Allied Chemical & Dye Corporation, announced that its large new plant at Danville, Ill., would be in production within 30 days.

Similar facts concerning the supply situation were also reported recently by E. I. duPont, the other major producer of such chemicals. At the annual meeting of the Air Conditioning & Refrigeration Institute in Hot Spring, Virginia, a duPont spokesman stated that the demands for air conditioning, refrigeration and expanding aerosol markets "will not exceed within a decade the capacities now being built."

General Chemical's announcement also referred to recently completed expansions of its Baton Rouge, La., facilities. "These increases, together with our new Danville unit, and the additional capacity being installed by others, place manufacturers in an excellent position to meet every need for the foreseeable future," is the statement of General Chemical's spokesman.

"All demands are now well satisfied and our market studies indicate new capacity is sufficient to meet the long-range growth of consuming industries. This means that contemplated developments and expansions by both aerosol and refrigeration manufacturers can go ahead with full assurance that every requirement for these key chemicals will be met."

Magnus Chemical Has New Western Outlet

MAGNUS CHEMICAL Company Inc., at Garwood, New Jersey, is now represented on the west coast in the San Francisco Bay area by Jaxon Engineering Specialties, manufacturer's representatives, it was announced recently by Alex Johnston, owner of the engineering firm. Johnston also operates Pacific Marine Refrigeration, Inc., west coast marine refrigeration service and maintenance specialists.

Classified Advertising

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings: $15.00 per inch for line listings.

Positions and Help Wanted

WANTED — Experienced operating engineer for 300 ton plant — car ice only. Write to P. O. Box 122, El Paso, Texas.

USED EQUIPMENT—wanted & for sale

FOR SALE—1 Y30 York, 8x8, no motor, with grooved pulley and V belts. The Gus A. Regnier Refrigerating Engineering Co., 532 Winchester Ave., New Haven, Conn.

FOR SALE — Refrigeration equipment; ice equipment; new, used. Advise us your needs. Use "QUICKSEAL" — stops brine tank leaks; easy, efficient, economical. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois, WAbash 2-3299.

WANTED — Two 100 h.p. used Freon compressors with or without motors or starters. Late type preferred. Chillers, evaporators or towers for same. Write or phone, Sammy's Refrigeration Service, 10 Spring St., Monticello, N.Y. Phone 1266.

FOR SALE — 1344 feet of FINNED PIPE — 12' lengths. Made from 2" pipe — 7" fins — 1½" apart. All heavily galvanized. NEW at half price. Also 150 steel hand trucks — roller bearing wheels, $6.00 each new. West Side Cold Storage Co. 7 Harrison St., New York 13, N.Y.

FOR SALE — One 15 ton York, 4 cylinder, V type. One 16" x 7'6" new York condenser. 5 x 5, 8 x 8 Yorks; one 9 x 9 York $500.00. One 10" x 7" Worthington booster. Write E. Niebling, 1545 St. Clair Ave., Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE — Ammonia Compressors, 4 x 4, 6 x 6, 7½ x 7½, 8 x 8, 9 x 9, 10 x 10, 9½ x 9½. 75 ton evaporative Niagara condenser; 30 ton York, trunk type coil complete with agitator; ice plants, cans, cranes, agitators, blowers. Parke Pettegrew, 370 West Broad St., Columbus 8, Ohio.

FOR SALE
Two 4-⅜ x 4-¼ — 6 cylinder Frick compressors with Troy steam engines, 500 r.p.m.
Compressors 4 x 4 to 10 x 10.
Uetectic Plates 22" x 84" — ceiling mounted.
Air units, receivers, condensers, etc.
JOHN F. CARSON
"A" & Venango Sts., Philadelphia 34, Pa.
GArfield 6-2221

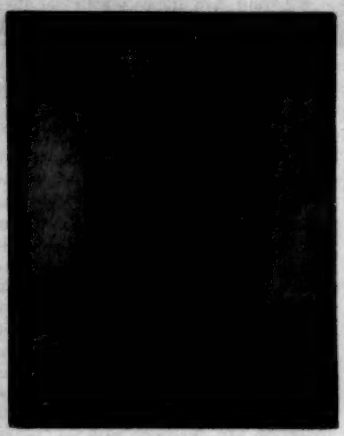
ICE PLANTS—for sale

FOR SALE — Because of ill health will sell good, going, year round ice business in Las Vegas, Nevada. 50 ton tube, 30 ton block. Perfect location. Polar Ice Co., 1010 N. Main St., Las Vegas, Nevada.

FOR SALE — one ten ton Frick ice plant, installed new in 1945, complete with following: 7" x 7" compressor with 40 h.p. motor; submerged brine cooler and agitator; 144 can tank complete with deck top and cans; receiver, traps and completely pipe system. I. D. Wood, Enfield, N.C.

WANTED — Ice plants manufacturing 300 lb. can ice. Must have minimum of 4 can pull. Tank size 200-600 cans. State size, age, condition, price and availability. Tri-State Engineering & Sales, Inc., Box 907, Salisbury, Md.

FOR SALE—USED ICE PLANTS & REFRIGERATING EQUIPMENT
Complete Ice Plants 20 to 100 Tons
Ammonia Compressors, 3" x 3" to 12½" x 14½"
Condensers, Cranes, Blowers, Scoring Machines, Ice Cranes—Various sizes. 100#—500# Ice Cubers. Write or wire us on any equipment you may need.
ENTERPRISE EQUIPMENT CORPORATION
77-79 Alexander Street, Yonkers, New York
Cable Add: ENEQCO Phs: Yonkers 8-8118-9



The Book of "Refrigeration Knowledge"

Basic Refrigeration is designed to give a good working knowledge of modern refrigeration principles, equipment and its operation. Beginning with the fundamentals and generally understood materials, it progresses through basic details of equipment to application, operation and servicing of systems.

BASIC REFRIGERATION

PRINCIPLES • PRACTICE • OPERATION

By Guy R. King

29 Chapters—340 ILLUSTRATIONS

526 PAGES

COVERING THESE SUBJECTS

- Fundamentals
- Compression System of Refrigeration
- Refrigerants
- Expansion Valves
- Evaporators
- Compressors
- Condensers
- Flow Equipment
- Electric Controls and Control Valves
- Lubrication
- Defrosting Methods
- Compressor Drives
- Food Preservation
- Operating
- Servicing
- Refrigerated Enclosures
- Instruments and Meters
- Heat Calculations
- Humidity in Refrigeration
- Compressor Calculations I
- Compressor Calculations II
- Refrigerant Lines—Pressure Drops
- Brine in Refrigeration
- Liquid Cooling
- Complete Systems
- Carbon Dioxide—Dry Ice
- Altitude and Its Effect
- Absorption Systems
- The Refrigeration Code

Different refrigerants and the various sizes of equipment are all given equal treatment. There are no complicated formulae or mathematics in the book. It develops the subject in logical step-by-step method with clear explanation of all factors.

Special drawings supplement the material in the text and explain basic factors. Of some 340 illustrations, the majority are special drawings which detail fundamental points in an easily understood fashion. Frequent examples are worked out in the text to show step by step solutions.

How automatic controls operate and what they do in the system are explained in simple terms. Parts and their functions are shown. This important field, in present-day refrigeration, is covered in a fashion that tells how to use controls and keep them operating to good advantage.

Send for this Book—$6.00

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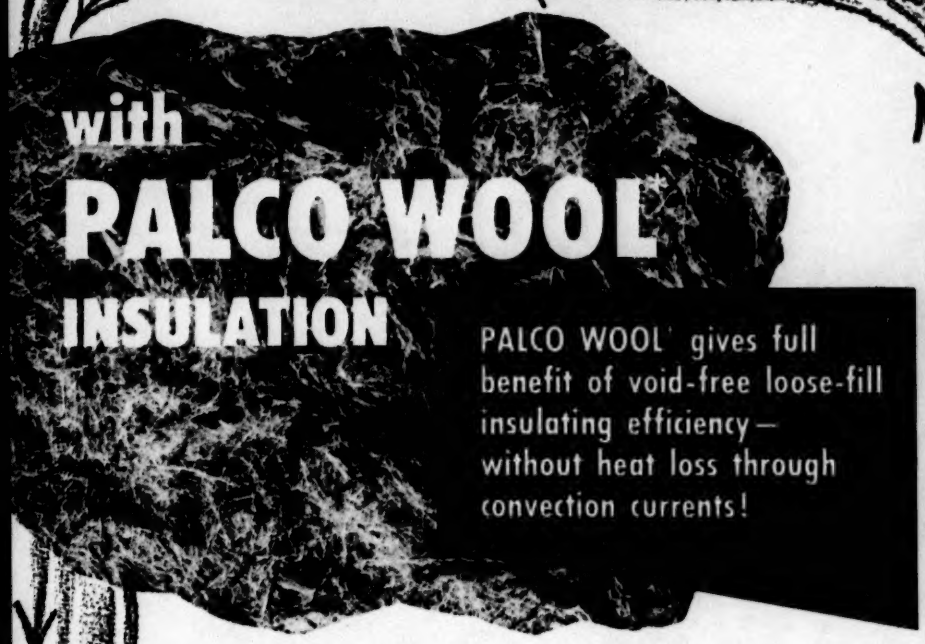
STOP CONVECTION CURRENTS

COLD SIDE

WARM SIDE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PALCO WOOL
INSULATION
PALCO WOOL* gives full benefit of void-free loose-fill insulating efficiency — without heat loss through convection currents!

It is well established that loose-fill insulation packed to the proper density offers extremely low heat transfer But when any insulation is installed at too low a density, it contains so much free air that there is very little resistance to *convection* currents. Warm air rises along the warm side of the wall, travels freely to the cold side, where it discharges heat as it falls through the insulation.

PALCO WOOL* has the inherent low "K" factor of .26 Btu, and when packed at its ideal density of only 4.5 lbs. per cu. ft., virtually eliminates measurable heat loss through convection currents. PALCO WOOL* displaces so much air, and breaks it up so completely that appreciable current movement is impossible.

That's one of the reasons why PALCO WOOL* is recognized as the ideal cold storage insulation—offering full void-free insulating efficiency—without heat loss due to convection currents.

Send for these aids to Better Cold Storage Insulation

THE PACIFIC LUMBER COMPANY

PALCO INSULATION WOOL®

100 BUSH STREET, SAN FRANCISCO 4, CALIFORNIA

THE PACIFIC LUMBER COMPANY
100 Bush Street, San Francisco 4, Calif.

Please send me, without obligation:

- ☐ **In-place test data on insulated structures**
- ☐ **Sample of *Palco Wool** Insulation**
- ☐ **Complete Cold Storage Manual**

Name _____

Title _____

Company _____

Address _____

City _____ **Zone** ____ **State** _____

South of the Border

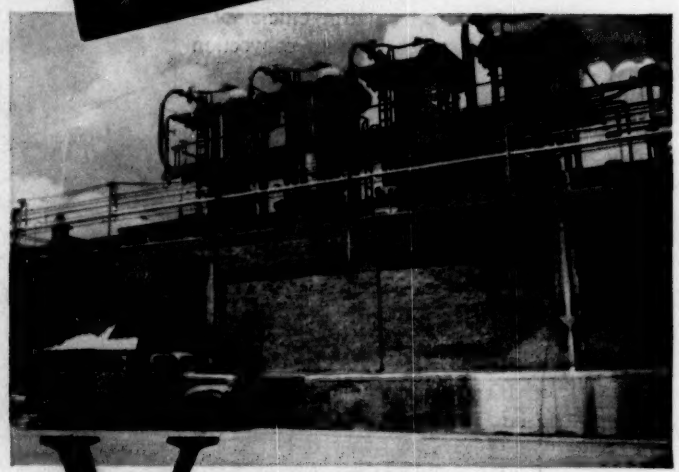
200 tons daily capacity

TUBE-ICE MACHINES

INSTALLATION

for **Cerveceria Cuauhtemoc, S. A.**

Monterrey, Mexico



This leading Mexican brewery installed two Vogt Tube-Ice Machines to serve their Monterrey plant several years ago, and two additional units were recently placed in operation to meet increased plant production.

Mounted on top of the ice storage building, a total of 200 tons of crushed Tube-Ice is discharged daily from the battery of ice machines to the storage room beneath. The ice is used for keeping beer cool during delivery by trucks and is supplied free of cost to refreshment stands and beer gardens where the product of Cerveceria Cuauhtemoc is sold.

In addition to making ice, distinctly versatile Tube-Ice units can be easily adapted to the production of cold water for wort cooling in any brewery. Write for Bulletin TI-3.

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Vogt Automatic TUBE-ICE MACHINES